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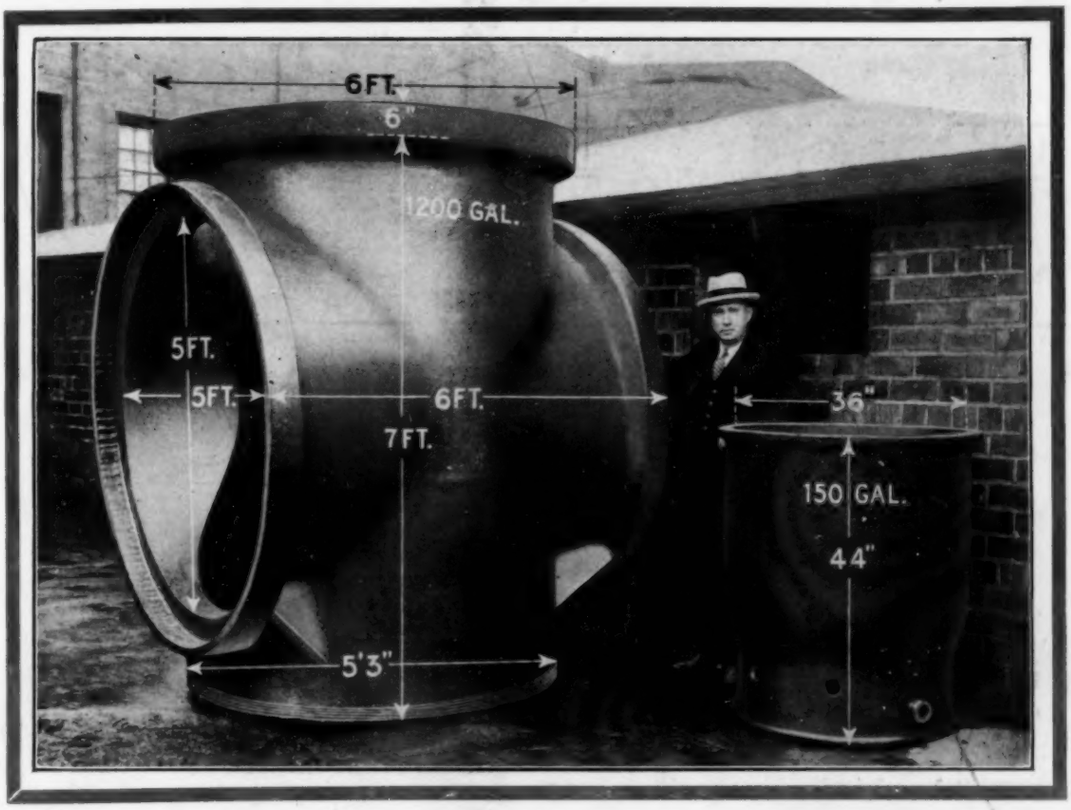

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CHEMICAL & METALLURGICAL ENGINEERING

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Editor

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The Engineer Vindicated

FOR complete reversal of attitude it would be difficult to match the action of Secretary Work of the Department of the Interior in yielding to the storm of protest that followed his removal of Arthur P. Davis as director of the Reclamation Service. It will be recalled that he filled this position by the appointment of D. W. Davis, more or less prominent in politics. Last week the Secretary announced the transfer of D. W. Davis to a newly created division of finance in the Reclamation Bureau and the appointment of Dr. Elwood Mead as Commissioner of Reclamation. Thus the conduct of the government's reclamation activities is again in the hands of an eminent engineer.

Although the incident has no direct relation to chemical engineering, it is worth recounting in *Chem. & Met.* When Secretary Work removed A. P. Davis, an engineer of good repute and long experience, and placed a political appointee in his stead the engineers of the country, through the American Society of Civil Engineers, American Engineering Council and *Engineering News-Record*, voiced a mighty protest at this disregard of the necessity for engineering direction of the government's greatest engineering projects. The Secretary stood his ground for a time, meanwhile appointing a fact-finding commission to investigate reclamation activities. The final outcome is an appointment in which the engineers of the country have won a victory.

Expert Solution Of Europe's Problem

FOR the first time since the armistice an international commission has achieved conspicuous success in devising a plan to restore Germany to economic independence and place the whole of Europe on the road to commercial and industrial recovery. The Dawes and McKenna reports submitted last week to the Reparation Commission have generously fulfilled the hopes and expectations of the world in laying the groundwork for a resumption of international trade and a return to industrial peace and stability. At the moment it seems impossible that any of the nations concerned can reject the commission's plans. They may be modified in detail, but they must be accepted in principle. Politics and militarism have been thrown to the winds by the experts, who have based their recommendations "upon those principles of justice, fairness and mutual interest in the supremacy of which not only the creditors of Germany and Germany itself but the world also have a vital and enduring concern."

The Dawes report makes officially clear some things long maintained by clear thinking men everywhere. Germany must pay. She has large resources and no internal debts and consequently can assume quite as large a national obligation as the most tax-burdened nation in Europe. At the same time she must be free from military or political interference with the exploitation of her own resources. Her finances must be rehabilitated and supported by a foreign loan. Reparation payments must be flexible, rising or falling with an index of prosperity which is defined by the commission. Such is the tenor of the principal findings.

It is significant of the attitude of all the nations toward the Dawes commission, as well as the fairness of its recommendations, that the report was generally received with favor. Even in Germany it elicited commendation instead of the violent opposition that has been voiced against all earlier proposals to settle Europe's economic problem. The first reaction is an omen of an early and agreeable settlement.

Going Back to the Laboratory With a Manufacturing Process

WHEN a process is developed nowadays, it usually takes its regular course from the test tube and beaker, through the semi-plant scale development to the design and construction of the manufacturing plant. In this way economy and intelligent direction are possible. The right materials of construction are found. Proper heat balances are worked out. Maximum yields and efficient operation are obtained. All this is so universally accepted that it needs neither emphasis nor indorsement.

There are dozens of manufacturing processes, however, in the chemical engineering industries that were developed before chemical control or chemical engineering existed in any but a rudimentary state. Toward these processes the chemical engineer is beginning to turn an intelligent scrutiny. Within the last few years nearly every unit process has been made the subject of constructive study. Frequently different industries have worked out excellent results on the specific application of the same unit process.

In this issue there is a brief account of a frontal attack on sugar boiling, using modern research weapons of attack, which means taking the process back into the laboratory, though not to the test tube and beaker. In sugar boiling there is a combination of unit processes—evaporation and crystallization—that has been developed empirically to a high degree of efficiency. A peculiarly sensitive system had to be handled so as to produce consistent results. And it is being handled successfully. But the process is largely an art and dependent upon skillful handling by the sugar boiler. There is a great deal to be found out about the process and inevitably as it is studied better understanding, better control and economy of production will result.

The apparatus designed by the scientists of the Bureau of Chemistry is ingenious in the flexibility of construction that will permit the reproduction of widely

varying plant conditions. The visibility of the process in the evaporating unit will permit unusually close examination of the process.

In addition to its specific utility for the sugar problem, the equipment can be used to great advantage in investigating a number of industrial evaporating problems encountered in the production of other materials. This type of apparatus deserves the thoughtful consideration of production men. It eliminates the great stumbling block in the way of an intelligent study of manufacturing processes in the laboratory by duplicating plant conditions on a small scale.

Soldier Bonus Should Be Killed

AS a fiscal measure the proposed soldier bonus is the very antithesis of tax reduction. Economically the two are incompatible. Whoever favors federal tax reduction, and it is doubtful if there are any who do not, cannot consistently support the payment of a bonus to able-bodied veterans of the World War. Accordingly *Chem. & Met.* has always supported Secretary Mellon's proposals for tax reduction as well as his consistent opposition to a bonus. We see no alternative to a continuation of this attitude and the vigorous exercise of our influence to accomplish both ends.

Estimates of the cost of the bonus vary widely. But even if we assume that the veterans are minimizing the cost, failing to include the expense of administration, and if it be granted that the actuaries of the Treasury are including in their estimates every possible item of expense that may accrue to the bonus, we are still confronted wth the fact that the measure involves billions of dollars. Rich and poor alike will have to pay the bonus by additional taxes that will be no less onerous because they are spread out over a long term of years. The veterans themselves will be in the peculiar position of contributing to the nation's largesse. At the maximum estimate of roundly $5,000,000,000 the per capita cost will be about $50, and for every family of five persons, however poor, the cost will approximate $250. At the minimum estimate the per capita contribution will be about half these amounts. In either event the program of tax reduction must be nullified, or delayed for years.

Latterly the veterans and proponents of the bonus have abandoned that expression, preferring to speak of "adjusted compensation" as being less suggestive of a gratuity or tip. It has been claimed, for example, that the bonus will "give to the soldier who offered his life with his service a compensation that will more nearly approach that of the laborer at home, secure from danger, and whose compensation increased from 200 to 300 per cent." Unfortunately for the bonus advocates, statistics show that civilian wages enjoyed no such increase as 200 to 300 per cent, particularly during the war. Figures compiled by the Bureau of Labor Statistics on percentage increase in average per capita earnings in thirteen industries during the war period show no increase higher than 60 per cent. The same authority shows that the highest increase in civilian wages was reached in August, 1920, nearly 2 years after the war was over, at which time veterans were free to enjoy high wages if qualified to earn them. Nearly 3,000,000 soldiers had been discharged and returned to civil life by July, 1919, a year before the peak in wages was reached. But granting that the cash compensation of the soldier was lower than the wage received by his civilian co-worker, it is ridiculous to argue that the small sum he would receive as a bonus would equal the difference in income for the 19 months of war.

The American Legion is leading the fight for a bonus. But that excellent organization can speak for only a minority of the veterans of the World War. Probably the majority of the veterans are opposed to it. At least diligent inquiry in our own circle of acquaintance has always failed to discover a single man who favors the bonus for able-bodied men. A measure that can muster only a minority support from its proposed beneficiaries has little to commend it to business and industry. Even its political aspects and consequences have been greatly overestimated, though the subject affords a fine opportunity for oratorical gesture. The probability is that Congress will pass the bonus measure, but it is almost equally certain that President Coolidge will veto it. Opponents of the bill, however, should not rest too lightly on this assurance and should bring every legitimate influence to bear upon its defeat. The bonus should be killed once and for all.

Value of Diagnosis

AT FIRST glance it might seem futile to offer an exhaustive explanation of the reason for a patient's illness without suggesting a remedy, but on second thought it will be apparent that the discovery of fundamental and deep-seated cause of trouble is the first requisite to a clear understanding of the malady. Having first gone to the bottom of the matter, we are in a position to take the next step intelligently. All of which applies to one of the articles in this issue, which, although it is a diagnosis without an accompanying prescription, must nevertheless be useful to industry.

It has long been known that steel which is exposed to the action of a hot caustic solution and at the same time subjected to tensile stress often becomes brittle. This has been the cause of boiler failures where the water contained sodium carbonate and it has likewise been a source of trouble in the chemical engineering industries where similar conditions obtain. Evidences of trouble from this combination of conditions have not been lacking, though the reasons therefor have not hitherto been clear.

Two members of the faculty of the Massachusetts Institute of Technology have recently discovered the mechanism of this so-called caustic embrittlement, as a result of long and painstaking investigation. They show that cathodic hydrogen, produced by the electrolytic couples usually present where metals and solutions are in contact, penetrates the steel and reacts chemically with some of the non-metallic inclusions. Other inclusions are soluble in the hot caustic solution. Capillary cracks produced by the combined effects of stress and chemical action on minute inclusions assist the penetration of both reagents. As most of the non-metallic inclusions occur at the grain boundaries, intercrystalline fracture is the result.

Although the authors offer no specific remedy for the trouble, that will doubtless come as a result of further investigation. Thus far we have only the diagnosis, which is of real value; for with a knowledge of the mechanism of failures due to intercrystalline fracture

the chemical engineer will doubtless find it possible to avoid in some cases one or more of the factors that combine to cause the trouble.

Science or Pseudo-Science For Public Consumption

SCIENTISTS have been blamed for the abstruse manner in which they publish their findings, and for the unintelligibility of scientific articles in so far as the "man in the street" is concerned. Science, in the public mind, is confused with amazing predictions of revolutionary inventions, mechanical novelties and new religions. Sensationalism and inaccuracy usually go hand in hand in an endeavor to profit financially from a prostitution of the word science, the ultimate result of which is the discouragement of that for which the man of science devotes his life.

In 1920 a modest monthly magazine was started in London called *Discovery*, to serve as a mouthpiece for scientific information in a form understandable by ordinary educated people. The material published was exceptional in its broad interest, simple method of presentation and accuracy. Although not widely known on this side of the Atlantic, articles from it frequently found their way into the "Science and Invention" section of the *Literary Digest*. Toward the end of 1923 announcement was made that publication would be suspended, for financial reasons. However, an anonymous benefactor stepped in at the crucial moment, supplying sufficient funds to enable the publication to be continued, at least for awhile. "Nothwithstanding the succor that has come," the editor says in a recent issue, "it is for our readers to decide, in the long run, whether the present revival is to be permanent or for a limited space of time." This example will serve to indicate the difficulty of interesting the average man in the things that count, in the limitations as well as in the possibilities of science.

There is urgent need for means whereby the average writer can be educated to appreciate the value of correctness and accuracy when he makes an incursion into the domains of science or technology. Fiction, because of its broad appeal, has immense opportunity for education in simple and fundamental fact; but few novelists indulge in research other than to encourage the flight of their imaginations. One author in the March issue of the *Red Book Magazine* describes how the hero finds a spring of fresh water on a coral island; another, in the March issue of the *Cosmopolitan Magazine*, recounts how an alleged engineer was resting in Santiago, Chile, "after several months prospecting in the Andes north of Antofagasta, unsuccessfully, it was understood, for salitra," a substance which, it is explained, "is hardly less valuable than gold . . ." whatever that means; a special dispatch to a leading newspaper recently described the oil-flotation process thus: ". . . the ore is ground to flour and blown by air through a series of oil preparations, which save the floured bits of gold, silver and copper." This bunk educates, by unconscious absorption, hundreds of thousands, perhaps millions, of persons per day. In these three examples, taken at random, what a chance was lost for an interesting account of the formation of coral islands, for facts as to how *saltitre* (nitrate) is found, and for a popularized story of the physics of the flotation process! Current fiction, the daily newspaper and the pseudo-scientific magazine are responsible for much of the misinformation that is current on matters of ordinary knowledge.

Several journals are doing good work in an effort to counteract the ill effects of irresponsible publicity; and, as we inferred, the *Literary Digest* is aiding in the dissemination of worth-while knowledge by condensation and republication of scientific articles from authoritative sources. *Science Service*, under the able direction of Dr. Slosson, it is hoped, may ultimately be expanded into magazine form and illustrated in a manner calculated to assist in the comprehension of the subject under discussion. But the primary flow of reliable information in a form understandable by the average reader should be maintained. Moral and material support is needed in behalf of those publications that, for business reasons, cannot rely in large part on advertisements for income; and it is for this support that we make an earnest plea—for a recognition of the value of that higher science which is the basis of technical advance.

The Hazard of Dust In Industrial Plants

IN RECENT years dust has come to be regarded as a serious hazard in manufacturing operations. It is fair to attribute a large share of the credit for bringing this fact to the attention of industry to the experts of the Bureau of Chemistry. Careful investigations of many explosions and fires caused by dust have emphasized the necessity of great care in the design and operation of plants where dust hazards will be encountered. Important details, formerly neglected, have been pointed out and corrected and the corrections have since become standard industrial practice. The whole influence of the investigations has been constructive and wholesome.

In this issue there appears the report of the investigation made by Mr. Price and his co-workers in the Bureau of Chemistry of the disastrous starch dust explosion at Pekin, Ill. The report preaches an eloquent sermon. Here was a plant intelligently designed in accordance with the best rules for safe operation in the presence of the inevitable starch dust. A group of engineers in the plant devoted their full time to safety problems, with particular attention to the dust hazard. Yet in spite of all this precaution a ghastly tragedy resulted from the ignition of a dust cloud.

A hot bearing on a screw conveyor was the cause of the explosion. It ignited the wooden housing of the conveyor and the dust was in turn ignited by the burning wood. It matters little whether this hot bearing was the result of negligence on the part of the oiler or was caused by obstruction of the oil feed with dust. In either case the fault is not usually attended with serious consequences. It simply emphasizes the necessity of constant watchfulness, to see that the plant is designed correctly not only with steel and glass construction and fire doors, but with such seemingly minor things as conveyor hoppers constructed to prevent the spread of an explosion wave from room to room and with ground wires from all metal equipment to eliminate electrostatic discharges. Eternal vigilance must be the operating watchword in dusty plants so that hot bearings, employee carelessness and similar occurrences shall not jeopardize lives and property.

The Executive's Greatest Asset

Successful Administrative Work Depends Not on Formula or "System" but on Ability to Deal With Men

J. B. John

Head of Four Competing Companies. A Unique Tribute to Executive Competence.

THESE are joyous, self-confident days, when by merely cutting and mailing a coupon one can be assured of instant salary increases that will eventually reach five figures. It seems to matter little whether salesmanship, accounting, draughting or "executive ability" is to be mastered. Nor is the caliber of the individual a stumbling block. A coupon and from $5 to $100 will guarantee a mahogany desk with a row of push buttons.

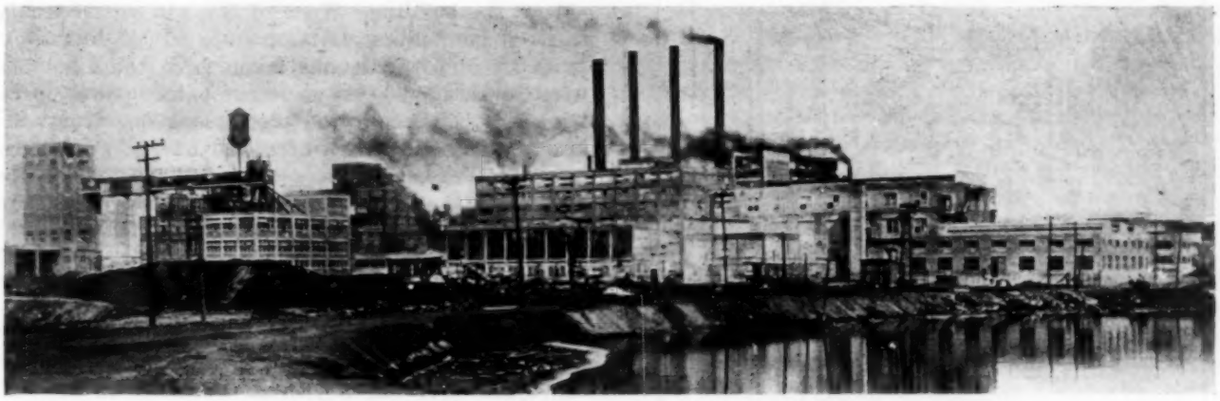
Of course the idea of self-improvement is a glorious thing. And with Browning we cry, "A man's reach should exceed his grasp, or what's a heaven for." The cheat and fraud begin only when it is implied that all subjects can be taught and that anyone can master.

The thought back of this protest is that there are factors in executive success that do not come to a man by teaching in its orthodox sense. It is possible to teach a man the technique of painting and perhaps gradually by practice he will be able to use that technique as a tool of self-expression. But unless he has a self that demands expression, a personality, he will never rise above the level of deft imitation.

So it is with executive work; the technique to be mastered is the detail of business and production. But that is not enough; plenty of clerks are masters of technique. There must be a touch of magic wherever there is a relation of man to man—a touch too subtle for the imitator. It is a sensitiveness, an understanding, call it what you will, that subordinates technique and makes an artificial method or "system" seem silly. Shall we seek an example?

Twenty-five years ago a young mechanic entered the employ of the Lehigh Portland Cement Co. His name was Jonathan Blaine John. He was promoted to foreman and then to superintendent. Later he was construction superintendent on a new mill and so gradually he became a master of cement technology. In 1913 his work was extended to new fields when he became general superintendent of the Newaygo Portland Cement Co. of Michigan. "We shan't be able to keep John long. He's too big for the job," remarked the president. But they have kept a share of him and he has since become president or vice-president and general manager not only of Newaygo but of the Petoskey Portland Cement Co. of Michigan, the Sandusky Portland Cement Co. of Ohio and the Manitowoc Portland Cement Co. of Wisconsin (now being constructed). These companies have a total daily capacity that is probably about 18,000 bbl.

To be executive head of four competing companies in the great cement industry is a job that requires unique executive ability, and therefore J. B. John should reveal those administrative talents that constitute a desideratum. Three things are outstanding: He is a master of the detail of cement manufacture in all departments. That is technique. He has a quiet, forceful, magnetic presence. That is personality. In even his casual dealings with men he displays the deft tactfulness that leads but does not drive, inspires but does not preach and that magnetizes a group of men into a unit. That is leadership.



General View of Plant—Buildings at Right Affected by Explosion

An Investigation of the Devastating

Starch Dust Explosion at Pekin, Illinois

The Official Report of the Experts of the Bureau of Chemistry Points the Way to Further Measures of Precaution Where Dust Hazards Exist

By David J. Price, Hylton R. Brown and Paul W. Edwards
Bureau of Chemistry, U. S. Department of Agriculture

THE explosion of starch dust at the plant of the Corn Products Refining Co. at Pekin, Ill., on Jan. 3, 1924, has proved to be one of the most disastrous industrial plant dust explosions on record. Forty-two men lost their lives in the explosion or died in the hospital as a result of the burns and shock received in the explosion or the fire that followed. The property loss has been estimated to be about $750,000, and the compensation claims amounted to approximately $175,000.

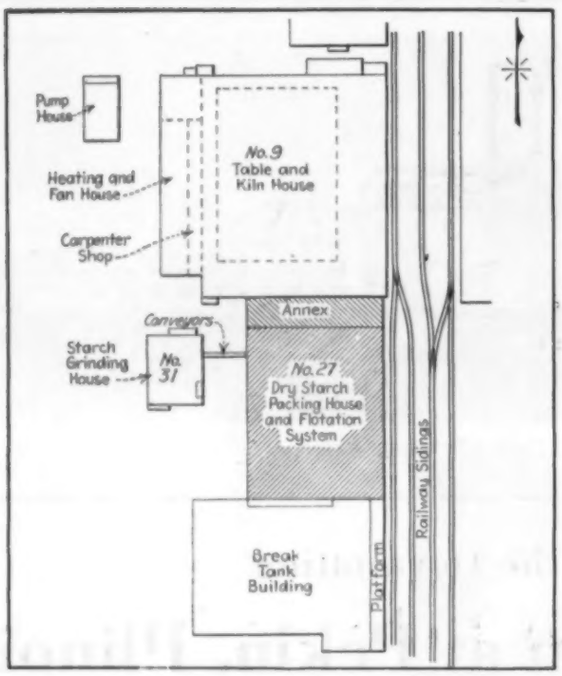
The plant at Pekin, owned and operated by the Corn Products Refining Co., is one of a chain of starch-manufacturing plants operated by this company. The buildings of the plant consisted of an elevator and storage tanks for handling the corn used in the plant; a steep house which contained the tanks where the corn was prepared for the starch-manufacturing process; a mill house, where the corn was ground; a starch-settling house, table and kiln house, starch-grinding house, starch-packing house, refinery and filter house, where starch was converted into glucose; a feed and oil house, where the byproducts were handled; the boiler house, office building, and numerous warehouses and smaller buildings scattered about the grounds. Practically all the buildings were of fire-resistive construction and the later additions to the plant were of the daylight type of construction, with large window area. Necessarily, however, a large part of the equipment in the various buildings was of wood or non-fire-resistive material, and some of the older brick buildings had interior woodwork.

Between 700 and 800 men were generally employed at the plant and less than one-third of this number, the night shift, were on duty at the time of the explosion.

At Pekin special attention was given to the preparation in bulk of the more standard products from corn, and no provision was made for the preparation of small package goods or the more recently developed derivatives.

Corn was received at the plant by rail and unloaded from the cars by power shovels at the corn elevator. From the elevator the corn was conveyed either to the storage bins or direct to the steep tanks, where it was soaked in a weak acid solution to prepare it for the mills. From the steep tanks the corn was conveyed to the degerminating mills, where it was cracked and broken. Following this operation, the germ was separated from the corn by a flotation process. The corn was then ground and passed through reels, which separated the hull from the starch and gluten. The germ was passed through presses to extract the oil and the hulls were dried and used for feed, while the starch and gluten went to the table house, building No. 9, where the starch and gluten were separated by allowing the solution to flow along slightly inclined troughs, in which the starch settled while the gluten flowed off the open end of the tables and passed into settling tanks.

After the separation of starch and gluten, the starch was removed from the tables and dried in kilns located on the first floor of the table house. These kilns consisted of long tunnels with a narrow-gage track running through them. The starch, in wire cages on wheels, was run into these tunnels at one end and taken out at the other after being exposed to the drying action of



Layout of Buildings of the Plant
Shaded area indicates buildings destroyed by explosion and fire.

heated air passing through the tunnel for a period of approximately 22 hours. Each kiln tunnel held eleven of the wire cages or cars, and one car was removed from each tunnel about every 2 hours, the entire line being moved up and another car placed in the tunnel at the opposite end.

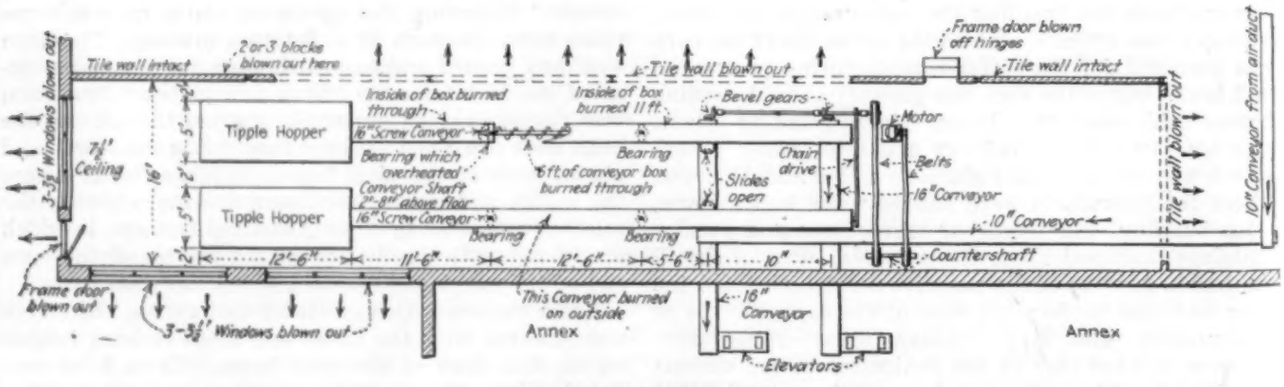
There were seven kilns or drying units in the building, each with its fan, heating coils and separate set of tunnels to be heated. The first heating unit cared for only six tunnels, while each of the other units heated nine tunnels, making a total of sixty drying tunnels. In the older kilns, fans forced the heated air through the tunnels, from which it passed into an exhaust duct in the basement, which was vented outside of the building. The air entered this duct, which also served as a dust-settling chamber, through a section of iron grating in the floor of the tunnel at the end opposite the fans. In the new kilns Nos. 6 and 7, which included the last eighteen tunnels at the northern end of the group, the fans were located in the basement and drew the air through heating units, through the tunnels into the basement air duct, and exhausted the air at the western side of the building. None of this air was recirculated through the heating units.

As the dry starch was taken from the kilns in the wire cage wagons, they were run onto a power-operated transfer, which conveyed them along the front of the kiln tunnels to the southern end of the group, where two tipple chambers were located. (See illustration.) These tipples, which were specially constructed devices for emptying the starch from the wagons, consisted of a platform mounted on a steel framework, which could be revolved to invert the wagon and permit the dried starch to fall into a hopper beneath the tipple, from which it passed into conveyors in the basement of building No. 9 and was transferred by means of cross-conveyors into the adjoining building on the south known as the annex. These conveyors are shown in one of the accompanying illustrations.

In the annex, a small building between the table house and the starch-packing house, the starch brought from building No. 9 was delivered by the conveyors to elevators, which carried it to the third floor, where it was discharged into conveyors leading into the starch-packing house, known as building No. 27.

There was a slight difference in floor levels between the annex and building No. 27. The starch conveyors leading into the starch-packing building from the annex ran just below the third floor level of building No. 27. These two conveyors discharged into hoppers which extended to within about 6 ft. of the first floor, where conveyors were installed to carry the starch to the boots of two elevators. Another conveyor was provided to carry starch to two reels located on the first floor, which fed into a conveyor running to the powdered starch house, building No. 31. The two elevators just mentioned extended to the top of the building and discharged starch into a series of conveyors, which fed four reels located in the northwest corner of the building. These reels in turn fed the starch into a series of conveyors, which discharged into hoppers over the starch packers.

The starch from the reels on the first floor was carried by a screw conveyor several feet above the ground level into the starch-grinding house known as building No. 31, a small two-story modern structure of the daylight type, located about 35 ft. west of building No. 27. In building No. 31 the pearl starch was ground in Andree mills and bolted through silk-clothed reels. After this process it was known as powdered starch, was conveyed



Basement of Building No. 9
The explosion originated here and the numerous comments make clear the deductions of the text that point to the overheated bearing as the cause. The tipple hoppers shown in this diagram are directly below the tipples shown in Fig. 4. Dust from the tipple ignited, causing the first explosion.

back to building No. 27 and was elevated and conveyed to special hoppers over the starch packers.

In addition to the equipment indicated, there were a number of tanks, filters and pumps located in building No. 27. Although the building was constructed partly of fire-resistive material, some of the floors and a large part of the equipment were of combustible material. It was this building that was so completely destroyed by the explosion and the fire that followed. The ground plan shows the location of the various buildings mentioned above and their relation to one another.

The Explosion and Its Extent

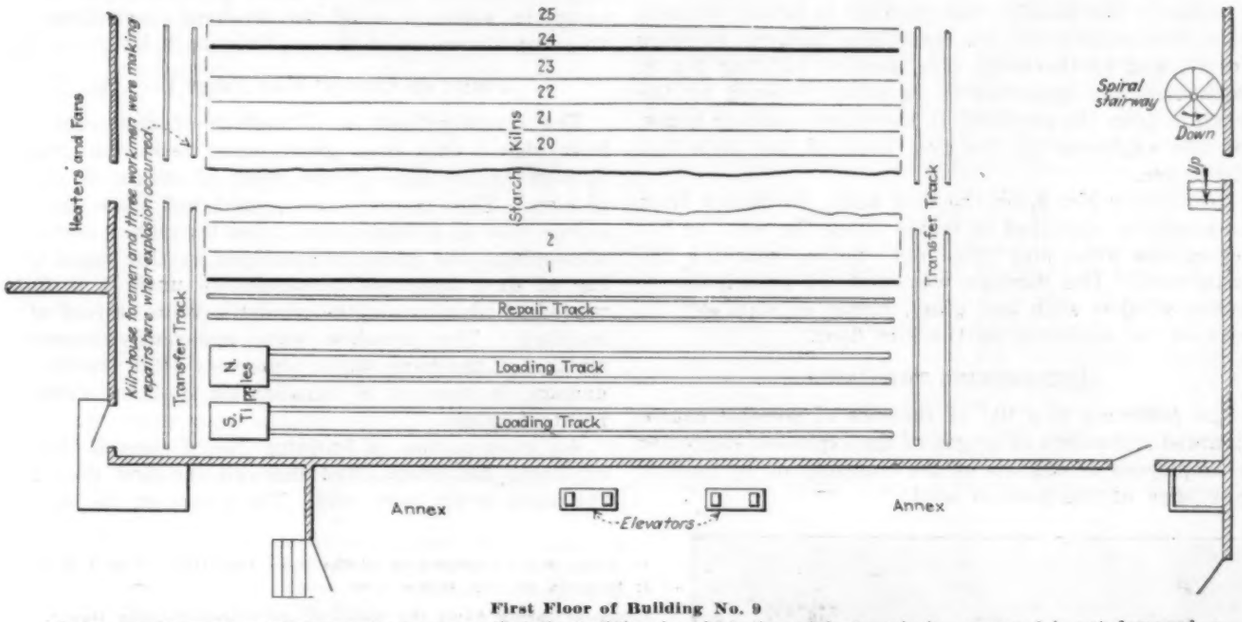
It is generally accepted from the statements of the survivors that the men in building No. 27 (starch-packing house) had finished their 3 a.m. lunch and returned to their respective places of work. The explosion in the starch-packing house occurred a few minutes later, about 3:35 a.m., the approximate time being established by an abundance of evidence. In the kiln house, building No. 9, the normal operating processes were being followed. Three workmen were engaged in loading wagons at the loading box. A starch buggy had just been dumped on the north tipple and was over the dump when the explosion occurred. Four of the employees were on the hot side of the kilns ten or twelve doors from the tipple trying to put back in the kiln a starch buggy that had jumped the track or had been pushed through the kiln door. The two men at the tipple had just finished dumping the buggy of starch on the north tipple. The men on this floor state that no explosion report was heard, although employees on the upper floors of this building heard from one to three reports.

The Pekin plant was continuously operated on the three-shift basis and shut down only for holidays or similar special occasions. The shutting down on New Year's Day, Jan. 1, meant of course a suspension of all operating processes for a period of 24 hours. Officials stated that in "shut-down" periods it has been found that the moisture content of the starch naturally increases and that on the resumption of operations the starch is "heavier" than during normal operation. This may explain the statement made by a number of workmen that in certain parts of the starch-packing house, at the time of the explosion, the dust was thicker than earlier in the evening. Previous experiences have shown that it requires about 20 hours after starting up for the moisture content of the starch to reach normal, which naturally would result in increased dust clouds as the shift advanced. The explosion apparently occurred approximately 20½ hours after operations began, which would allow ample time for the moisture content to be reduced to a percentage where a considerable quantity of dust would be created in the handling and packing of the starch.

At the time of the explosion the weather was very cold, with a temperature of about 12 deg. below zero. This cold weather continued for a period of several days, and on Jan. 5, two days later, an official temperature of 23 deg. below zero was recorded. This extremely low temperature would naturally be accompanied by low humidity and correspondingly dry air conditions, which would contribute favorably to circumstances surrounding dust explosions. Previous explosions elsewhere during periods of similar climatic conditions have assumed large proportions, causing extensive loss of life and property. The explosion apparently occurred at a time that might be considered as almost ideal for the ignition of explosive dust and the propagation of flame resulting therefrom.

It can also be naturally assumed that on an extremely cold night the windows and doors were tightly closed to keep the plant warm. This would result in increased dust clouds within the buildings and add materially to the hazard. The statements of survivors generally seem to indicate that considerable dust was present, probably due to the reason cited as well as to the reduction of the moisture content of the starch after continued operation.

The possibility of a starch dust explosion occurring and its effects appear to have been fully realized by



First Floor of Building No. 9

It is a curious and not infrequent occurrence that the building in which the original explosion occurred is not damaged.

both the workmen and the officials. It was generally understood that all precautions should be taken for the prevention of explosions, and steps were continually taken to adopt additional control measures. Safety engineers devoted their attention to safeguarding operating processes, and by means of special meetings and notices brought matters pertaining to explosion prevention to the attention of the workmen. The class of men employed in the plant was above the average, practically all of them being Americans with a high degree of intelligence.

Observations in Investigation

Building No. 27 was completely destroyed by the explosion and fire that followed, and nothing of the building and its contents remained save a mass of wreckage and débris. The annex building adjoining No. 27 on the north side was so badly damaged that it was necessary to tear down part of the walls in the course of the recovery work.

Building No. 31 was not damaged very much by the explosion. The damage was confined to broken window glass, particularly on the east side, toward building No. 27, and on the north side, toward building No. 9. These windows appeared to be blown inward by the pressure from the explosion in the starch-packing house, and the explosion on the first floor of the table and kiln house.

In building No. 9, on the first floor, the flames from the explosion appeared to travel along the west or hot side of the kilns and "died out" before reaching the north wall. The damage was confined principally to broken window sash and glass, blown outward by the force of the explosion on the kiln floor.

Determining the Cause

The following is a list of theories of possible causes advanced and points of origin of the explosion suggested by employees or officials of the company or by general knowledge of the process used:

1. Matches and smoking.
2. Foreign material in grinding mills.
3. Choke in elevator.
4. Incendiarism.
5. Sparks from external source.
6. Fire in kiln-heating system.
7. Electrical causes.
8. Static electricity.
9. Foreign material in conveyors.
10. Hot bearings.

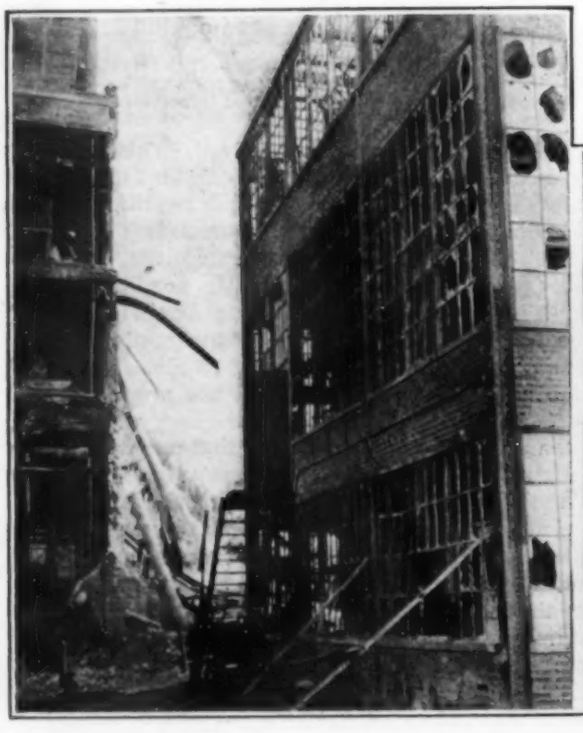
All of these possibilities were carefully investigated, and one by one they were eliminated until the last one, "hot bearings," was reached.

This has been the cause of a number of fires and in dusty places the resulting fire has sometimes been the cause of a dust explosion. An examination of the bearings on the starch reels, Andree mills and conveyors in building No. 31 showed them to be in good condition. However, a bearing on one of the conveyor lines in the basement of building No. 9 showed unmistakable evidence of having been the cause of this explosion. A complete summation of the evidence indicating that this was the cause of the explosion will be given later.

Point of Origin Was First Located

The investigations of a number of dust explosions have shown that in a great many cases the greatest damage is not done at the point of origin of the explosion. This is easily accounted for when one considers that as a flame propagates through a dust-laden atmosphere, the pressure developed by this rapid burning of dust increases tremendously until it is finally vented by blowing out the windows, walls or roof of the building. The pressure wave apparently travels in advance of the flame wave; thus very often the greatest damage is done at a considerable distance from the point of origin.

An examination of building No. 9 showed that the explosion had propagated through the first floor from the south to the north end. The covers on the gratings



At Left—The Extreme Cold of the Next Few Days Was a Handicap. It Reached 25 Deg. Below Zero.

Below—Clearing Away the Ruins of the Starch-Packing House.

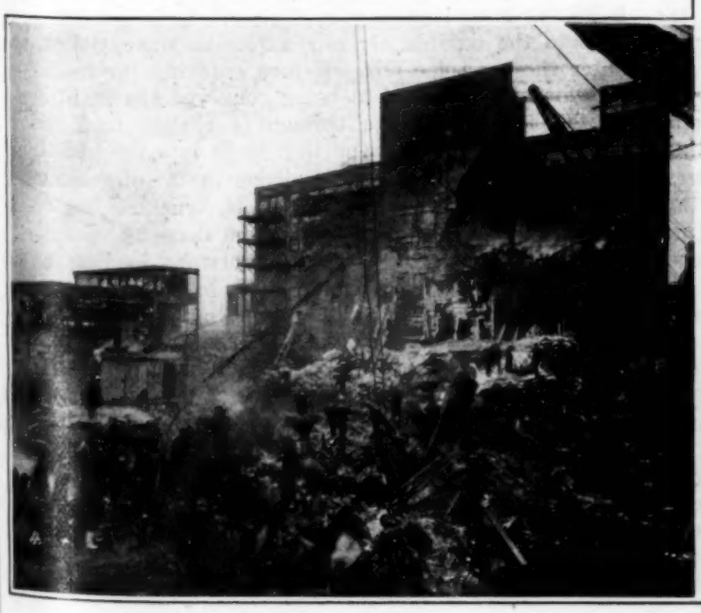
between the starch settling tables on the upper floors had been blown off, which seemed to indicate that it had propagated from the first floor. The path of the explosion could be traced back to the starch tipple or dump located at the southwest corner of the first floor. This was confirmed by witnesses who stated that the flames came from the tipple. This tipple was used to dump the dried starch from the starch wagons, which in turn were brought from the kilns located on this floor. When the explosion occurred a wagon was being dumped. The starch was carried from the two hoppers of the tipples located in the basement by means of two screw conveyors. At this point it was observed that the small windows on the south side of the basement were blown out, while a tile wall located just 16 ft. north of these windows, which separated the conveyor lines from the rest of the basement, was blown toward the north. This indicated that an explosion had occurred between the south wall of the building and the tile wall. The north conveyor box was found to be burned for a distance of approximately 6 ft., the cover was burned off at this point and a considerable portion of both sides of the box was destroyed (see photograph). The investigators believe this to be the point of origin of the explosion.

Having definitely located the point of origin of the explosion, search was made for all evidence available that might indicate the cause of the explosion. In the room where the initial explosion occurred there were a number of conveyor lines, the bottoms of the tipple hoppers and an electric motor with jack shaft, belts, chains and gears to drive the main conveyors and cross-conveyors. All equipment appeared to be in good condition except the wooden box of the conveyor carrying starch from the north tipple. Near one of the bearings this box was badly burned on the sides and bottom. The frame covers were almost entirely consumed and the sides of heavy pine planks were burned completely through for a distance of several feet. The interior of the box was charred on both sides of the bearing in gradually diminishing areas for a distance of about 4 ft. in the direction of the tipple hopper and about 11 ft., including the area completely burned, in the direction of travel of the material. The section of the box burned completely through measured about 6 ft. on one side and a little more than 4 ft. on the other side. Observation showed that the fire undoubtedly attacked the box from the inside and gradually burned through the wood of the top and sides. A photograph of the conveyor included in this report shows distinctly the condition of this equipment, and this condition indicates clearly that there was more than sufficient fire present to ignite any dust cloud that may have been present. The position of the tipple on the floor above shows that one of the starch wagons was in the dumping position when the explosion occurred. The first starch dumped from this wagon would have just about time to reach the scene of the fire by the time the explosion occurred. In the opinion of the investigators the conveyor box had burned sufficiently to permit starch to be blown from the conveyor in a cloud, and this cloud was ignited by the flames and produced the primary explosion in the basement at the southwest corner of the table and kiln house.

The cause of the dust ignition having been satisfactorily determined, it remained to determine the cause of the fire in the conveyor. In examining the bearing, shaft, hanger and conveyor box it was found that the shaft had dropped slightly in the hanger, but on opening the bearing it was found that the babbitt metal in the bearing had not melted or run. It was, however, very dry and badly scored on the end nearest the burned section of the elevator box, and the shaft was colored a dark blue or purple, which would indicate that it had been exposed to a temperature of at least 550 deg. F. for a considerable length of time. This temperature would not be sufficient to ignite starch nor would it be sufficient to melt many types of babbitt metals. It would,

At Left—Looking Toward the Annex and Building No. 9 Across the Ruins of Building No. 27—the Starch Packing House.

At Right—The East End of the Annex Was Completely Destroyed and the Wall Standing in the Photograph Had to Be Demolished.



however, be sufficient to ignite wood, especially if heating of the bearing had occurred at various times previously, or the temperature remained at approximately 300 deg. F. for a sufficient time to start charring or carbonizing.

It is the opinion of the investigators that the oiling of the bearing that started the fire was either neglected, or if the oil was put in the oil hole it failed to reach the bearing because the hole was clogged with starch. It was necessary to use heavy oil in these bearings because the high temperature of the starch passing them would heat the bearing so that thin oil would not last. It is possible that the hole became filled with starch to such an extent that the heavy oil would not run through to the bearing and it became hot enough to ignite the frame conveyor box, which in turn ignited the dust cloud formed when the tipple dumped the starch wagon and the primary explosion resulted.

Conclusion and Recommendations

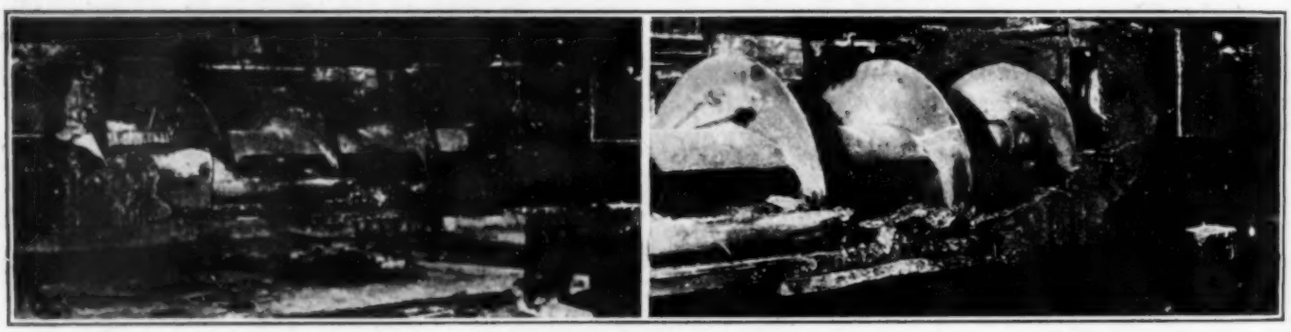
Immediately following the explosion the company began making plans for rebuilding the destroyed section of the plant in a bigger, better, safer way, benefiting from the experience gained in this disaster. This experience also indicated the necessity of adopting greater precautions in other plants in order to prevent another occurrence of this kind, and steps were taken by the company to incorporate in the operating methods at the other plants the lessons learned at Pekin.

The fact that broken windows constituted practically the entire damage to building No. 9, which housed the tables and starch kilns, indicated the superiority of this type of construction for plants where the explosion hazard exists. The windows or weak tile walls failed under the force of the explosion, but the strong skeleton framework prevented destruction of the building. Building No. 31, the starch powder house directly west of the completely destroyed starch-packing building, must have been exposed to a terrific force at the time of the explosion. The fact that this building is standing today with little damage to either the building or its equipment is undoubtedly due to the large window area and the light roof installed on the building. Practically every pane of glass on the north and east sides of this building was broken and the light tile roof was completely destroyed. The equipment, however, was undamaged or only slightly scorched. Even the slik cloth on the reels was not burned. Evidently the failing of the windows and roof relieved the pressure to such an extent that the flames did not have the penetrating effect they otherwise would have had.

Another lesson taught by this explosion is the necessity of adopting some other system of lubrication in sections of the plant where the explosion hazard exists. In bearings such as the one which apparently started the fire a positive system of lubrication, an oilless bearing or a hot journal alarm system should be installed. Such a system is especially necessary where the bearing is somewhat inaccessible or where thorough inspection is impossible.

As a means of limiting the extent of an explosion in plants of this kind, it is specifically recommended that parts of the process where the dust hazard exists be carried on in separate buildings and that all buildings in which the explosion hazard exists be separated and sufficiently removed from one another to prevent the propagation of flame among them. It seems to be almost impossible to protect openings between buildings against the flame of an explosion, because the flash travels too fast to operate automatic fire doors or shutters in time to prevent the passage of fire and the pressure of the explosion forces the flames through cracks and openings which would not provide a ready means of communication for an ordinary fire. The steel screw conveyor with choked discharge and loose covers has proved to be a satisfactory method of conveying material from one building to another in plants of this kind.

In installations of this type the buildings are separated sufficiently to prevent the spread of fire due to exposure and the conveyor lines between the buildings have loose covers that will be blown off and vent to the outside air any explosion wave that may enter the conveyor box. Before entering the building to which the material is being conveyed the main conveyor should discharge through a choked feed spout into a secondary conveyor that leads into the building. Such a system eliminates all direct means of communication between the buildings. If trucking between buildings is necessary, it should be done by means of an outside platform with the doorways leading onto the platform arranged so that those in one building are not opposite those in another building. The time has arrived when it is necessary to use in plants where explosive dusts are manufactured or handled the same precautions adopted by the manufacturers of powder and other explosives, especially the precaution of dividing the plant into units, because, while efforts should be directed primarily toward the prevention of explosion, it is well also to take all possible precautions to limit the extent of an explosion should the unexpected occur.



Burned Box of Starch Conveyor
The left-hand picture shows the relation of the burned section to the hanger.

Studying the Problems of

Sugar Factory Operation

Description of Some Ingenious Laboratory Equipment That Makes Possible the Intelligent Study of Plant Problems on a Small Scale

By F. W. Reynolds

Carbohydrate Laboratory, Bureau of Chemistry, U. S. Department of Agriculture

THE equipment here described was designed for use in the Carbohydrate Laboratory of the Bureau of Chemistry in connection with the constructive study of certain cane sugar and beet sugar manufacturing problems. In this investigation it was necessary to reproduce in the laboratory on an adequate scale the sugar factory operations of sugar boiling and crystallization in motion followed by centrifugal separation of sugar. A vacuum pan was required that would permit the exercise of the sugar boiler's art under controlled conditions and of such design that the various operations of producing grain, growing crystals of desired size, boiling mixed strikes, reducing the run-off to the desired purity, etc., could be performed in a satisfactory manner. In the case of the crystallizer it was necessary to produce crystallization in motion at definite gradients of temperature drop and with closer control of temperature than is customary in practice. Both vacuum pan and crystallizer have given very satisfactory results in this type of investigation.

In the design of small-scale equipment for duplicating factory processes, the question of capacity is of primary importance. For the sake of economy of materials and their preparation, the capacity should be kept as small as possible, and yet be consistent with reproduction of the essential features of the process. If only a quantity of finished product sufficient for analysis and testing purposes is required, the capacity can easily be determined. When, however, each run is one of a number of cycles, and the finished product of each goes to make up the raw material of the succeeding cycle, greater difficulty is encountered in preserving a balance of material and time economy consistent with satisfactory operation. If each cycle is sampled for the purpose of analysis and future reference, it is desirable that this sample represent a small proportion of the finished product. The question of mechanical loss also demands attention. While it is possible to conduct small-scale operations in a way comparable to a quantitative analysis, it is not often economical in time to observe the necessary precautions. Small losses assume large percentage values when small quantities are involved. Therefore, in designing small-scale equipment, it is desirable to take into consideration a certain degree of inevitable mechanical loss.

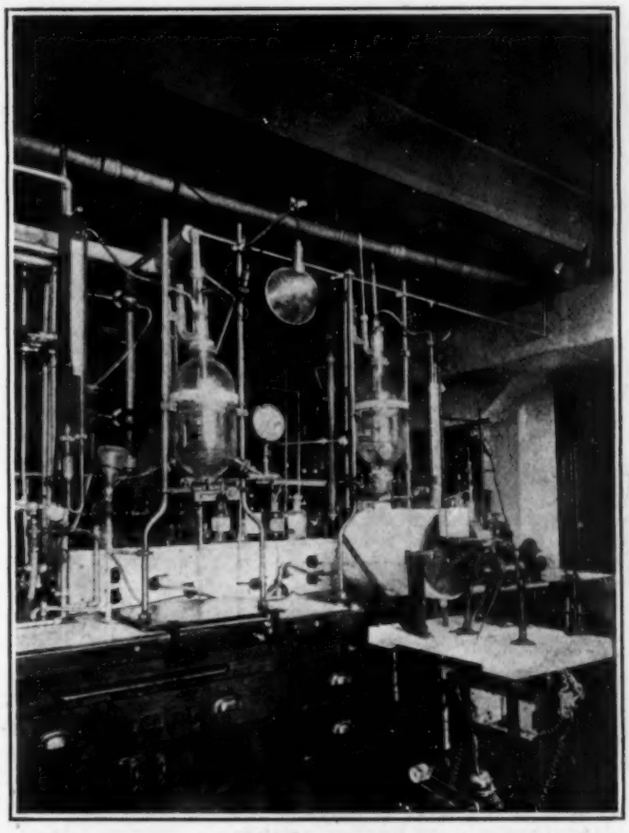


Fig. 2—The Laboratory Table
Showing two vacuum pans with crystallizer on the stand in front of the table ready to be pushed under the pan to receive charge.

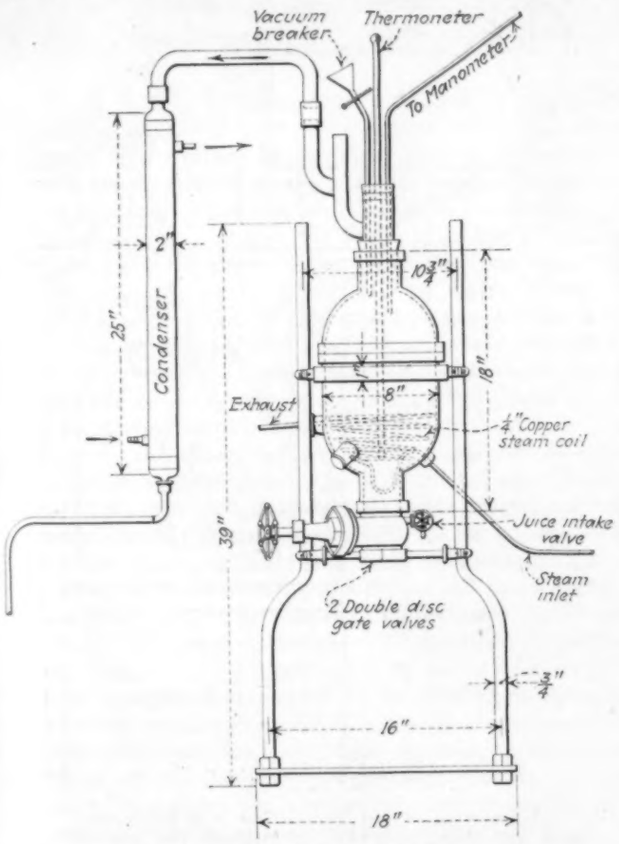


Fig. 1—Laboratory Vacuum Pan
The two features of the equipment are visibility of the operation and control of conditions.

Considering the mechanical features of the design of small-scale equipment, the first requirement is that of duplicating factory conditions in all essential details. The finished product, using such equipment, should be comparable in character to that produced in the factory under the same conditions. It is also desirable, if experimental work on the process is to be undertaken, that conditions be varied independently under the control of the operator and often in ways that are not possible in the plant. These factors have received attention in designing the equipment described below.

The dimensions and details of the vacuum pan are

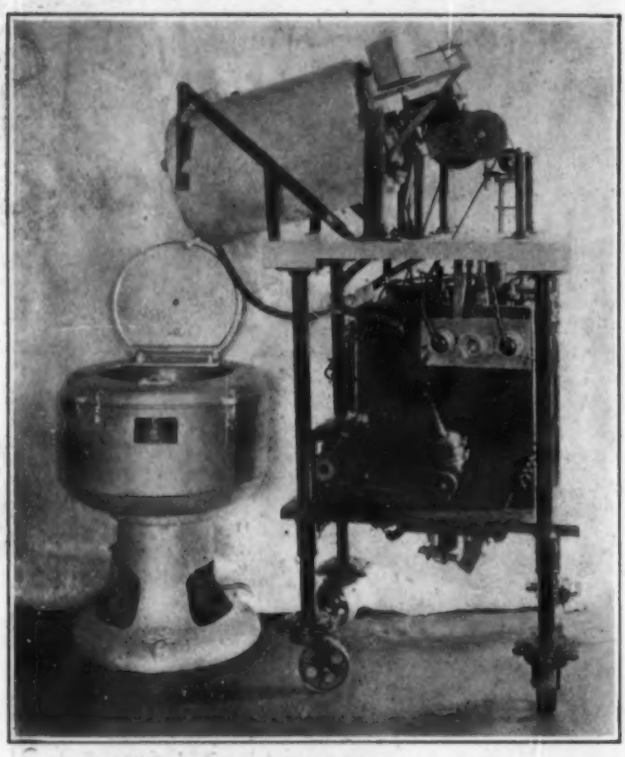


Fig. 3—The Crystallizer in Dumping Position
The cylinder tilts so as to discharge into the centrifugal. The photograph also shows the thermostat in the framework below.

shown in the drawings. The body of the pan is made of Pyrex glass. Three tubulatures are provided, as shown, two of them being used for intake and exhaust steam, respectively. The third may be used for insertion of a proof stick or other sampling device, or may be used as an intake for a second steam coil, both steam coils using the same exhaust. One pan is set up in the laboratory in this way, with seven turns in each coil, though only slight advantage in boiling is gained by using a second coil.

The coil connectors are designed to protect the rubber stoppers from the excessive heat of live steam with air cooling and at the same time to furnish an easy means of removing and replacing the steam coil. For discharging the contents a gate valve is provided, connected to the bottom of the pan by a short nipple and rubber gasket, and a ¼-in. angle valve is used as a sirup inlet. It is connected, by means of a short nipple, through a hole tapped into the gate valve just above the seat. This system makes it possible to boil by the so-called set valve method. The boiling may be controlled by a brasmoscope (see Noel Deerr, Haw. Agr. Chem. Bull., vol. 20, pp. 1-29), a sensitive thermometer and closed-arm manometer being provided. The thermometer is graduated from 0 to 100 deg. C. by fifths of degrees and is 30 in. long. A closed-arm manometer is preferred to an open-arm manometer, as corrections for atmospheric pressure are then unnecessary. It may be graduated in inches of vacuum on the basis of standard atmospheric pressure, if desired. A water jet filter pump is used as a source of vacuum.

The condenser is made of five parallel ¼-in. copper tubes surrounded by a water jacket so as to permit easy cleaning of the tubes, which, however, is seldom necessary. The base and support for the stand were designed so as to allow the crystallizer to be placed underneath the discharge valve when the pan stands on a table 39 in. high. The top part of the pan is cemented to the bottom with adhesive tape and painted with a good enamel to make an air-tight joint.

The Small-Scale Crystallizer

A photograph and diagrams (Figs. 3, 4 and 5) show the essential details of the crystallizer. It is mounted on a stand that is made of iron pipe and standard pipe fittings and runs on casters so that it may be moved first underneath the pan to receive the charge and then to the centrifuge for discharging. The crystallizer proper is mounted on trunnions and so supported that the discharge end may be lowered to allow it to drain into the centrifuge.

The essential features of the crystallizer are the stirring mechanism and the temperature control. The charge from the vacuum pan is agitated by a double ribbon on a shaft that makes about three-quarters of a turn per minute and is driven by pulley and gears from a ⅛-hp. 1,750-r.p.m. motor.

The temperature is controlled by circulating water from a thermostated bath through the jacket surrounding the crystallizer. The bath itself is a wooden box 14x14x17½ in., lined with copper and the temperature is controlled by a mercury thermoregulator. The temperature of the water can be controlled and under ordinary conditions it is gradually reduced. The regulator control is designed to be run either from a clock or from the pulley of the stirring mechanism. The speed

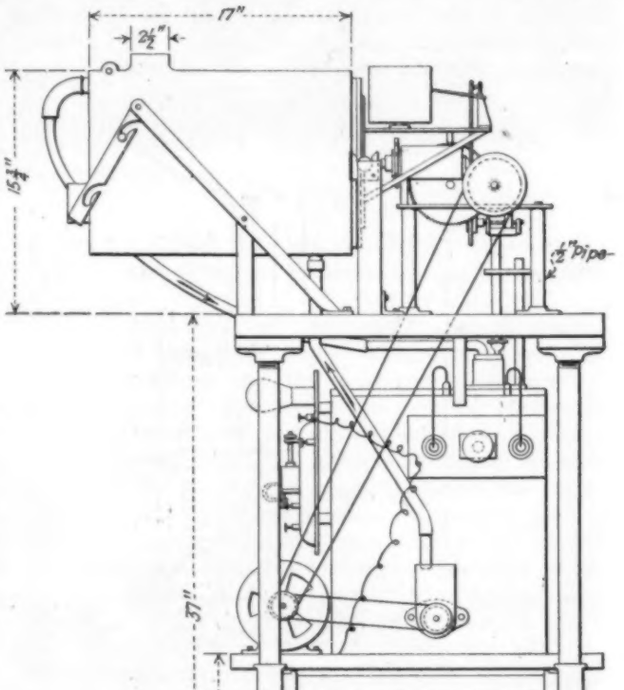


Fig. 4—Diagram of Crystallizer and Thermostat
Compare with photograph (Fig. 3) and note the crystallizer cylinder in operating position, the course of the cooling water indicated by arrows, the circuit breaker on the left-hand side of the thermostated bath and the belts that operate the stirrer and thermostat regulator.

of the pulleys as shown is such as to drop the temperature of the bath about 45 deg. C. in 72 hours. This rate of drop is, of course, dependent upon the speed of the pulleys, the volume of mercury in the bulb of the thermoregulator and the diameter of the capillary.

Two heaters, of 500-watt capacity each, are used to maintain the cooling water at desired temperature. It is necessary to control them with a Cutler-Hammer magnetic switch, since the spark at break is too large to be handled by the telegraph relay. A safety float protects the heaters in case they should become uncovered by water, either through evaporation or accidental leak-

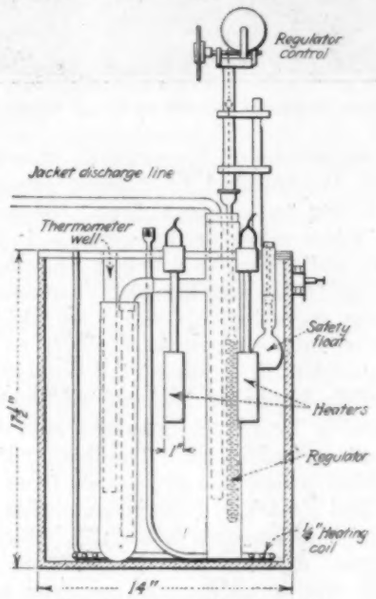


Fig. 5—Thermostat Control

age of the bath or its connections. It consists of a small Florence flask fitted with a short test tube containing mercury. This is not an essential feature of the electrical connections, but merely a device for the protection of the heaters. Wells are provided in the bath for the thermoregulator, and also for the bulb of the recording thermometer. These wells act as baffles, and assist in maintaining efficient circulation of the water; there is the additional advantage that the thermoregulator and thermometer, when placed in these wells, are controlled by the temperature of the water leaving the crystallizer jacket rather than by the temperature of the bath itself, thus compensating for unequal radiation losses in the crystallizer. A steam-heating coil is placed in the bath to bring the temperature of the bath quickly up to maximum. Two 500-watt heaters are ample to maintain a temperature of 95 deg. C., but will not bring the bath up to that temperature from room temperature in a reasonable length of time. The steam coil is, of course, disconnected after the desired temperature has been reached. The water is covered with paraffine to reduce evaporation.

There is attached to the shaft of the stirring mechanism a recording plastometer, which indicates and records on the dial of a recording clock the changes in apparent plasticity of the material as it cools. This is not an essential feature of the crystallizer, but is merely an accessory that is being used in these experiments. This device should be of value in the study of other industrial processes where stirring is used. Detailed drawings of the various parts will be supplied upon request to the author.

Lime for Sand-Lime Brick

On page 467 of *Chem. & Met.* for March 24, 1924, an article appeared erroneously headed "Quicklime Specifications Recommended for Sand-Lime Brick Making." That head should have read "for Silica Brick Making."

The lime for use in sand-lime brick is determined partly by the fact that this variety of brick is made by mixing sand and lime, pressing the mixture into brick form, and curing with high-pressure steam. The steam causes a chemical reaction to occur between the lime and sand, forming what is believed to be a hydrated calcium silicate. This silicate acts as a binding material to hold together the excess sand, which forms the major portion of the brick.

The lime must be completely hydrated before it is mixed with the sand and made into brick. Otherwise, subsequent hydration is apt to weaken or disrupt the brick. Overburned lime or magnesia may cause trouble, because they hydrate slowly.

Most manufacturers of sand-lime brick prefer, for economical reasons, to buy quicklime and make their own hydrate. Others buy commercial hydrated lime.

Bureau of Standards Circular 150 gives the following recommended specifications for this lime. These have been adopted after consideration by all interested government departments and by the National Lime Association:

(*a*) *Quality.* Quicklime must be of such a nature that it will slake freely and completely. It must, therefore, be free from ashes, clinker, fused silicates and similar visible impurities. Hydrated lime must be completely hydrated. Such chemical impurities as silica, iron and alumina may be regarded merely as diluents, except when they are fused with the lime to form slowly slaking compounds.

(*b*) *Composition.* Quicklime or hydrated lime shall contain not less than 85 per cent calcium oxide nor more than 5 per cent magnesium oxide, both figures being based on the non-volatile portion of the material.

The carbon dioxide in the quicklime as received shall not be more than 5 per cent. The carbon dioxide in the hydrated lime as received shall not be more than 7 per cent.

Hydrated lime shall contain sufficient water to meet the chemical requirements of the calcium oxide.

Correction

In the article entitled "Metals for Handling Organic Solvents" in the March 31 issue there occurred an error in the table of "non-ferrous metals tested." The following:

Cr and a rich gold
Cr and a copper
Cr and a low brass
Cr and a aluminum bronze

should have been written:

CR & A rich gold
CR & A copper
CR & A low brass
CR & A aluminum bronze.

Canadian White Arsenic Production Rising

A report from Canada says that last year Ontario produced 5,158,617 lb. of white arsenic, as compared with 4,118,695 lb. in 1922. The incentive to this increase was the much higher price obtainable, being 11.28 cents against 7.28 cents in 1922.

Producing Natural Sodium Sulphate in Arizona

Thenardite, Anhydrous Sulphate of Soda, Is Purified and Used by the Paper Industry of the Mississippi Valley

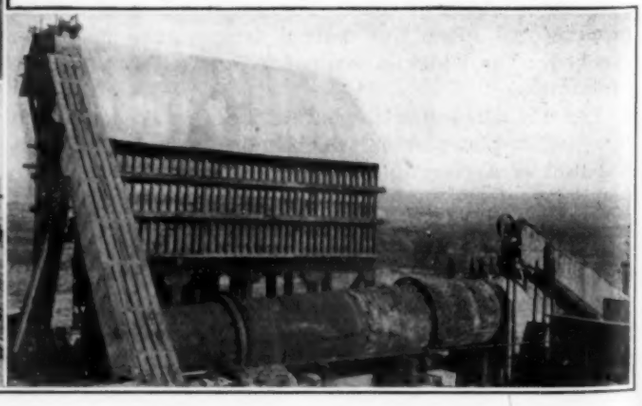
Thenardite (Sodium Sulphate) Deposit at Camp Verde, Ariz.

WESTERN CHEMICALS, INC., of Los Angeles, recently started operation of a new plant at Campe Verde, in the Rio Verde region of Arizona, for the recovery of a commercial sodium sulphate from the deposits of thenardite that outcrop along the side of Copper Canyon, a few miles southeast of the old military post. The thenardite (Na_2SO_4) is associated with about 10 per cent of sodium chloride and varying amounts of insoluble impurities, a commercial product being obtained by the aid of a simple washing and drying process. Early attention was drawn to the sulphate content of the deposit because of the ill effects of its use on cattle, as a lick, the idea being prevalent that it contained mostly salt.

The paper and pulp trade requires a product with not more than 5 per cent of sodium chloride, anhydrous and acid free. The problem of meeting requirements has been solved satisfactorily, and an output of 300 tons per day is being maintained, all of which is being shipped direct in carload lots to plants in the Mississippi Valley region.

A primary crusher is arranged so that it can be moved into the deposit as the first cut proceeds. This plan of operation, incidentally, will assist in making a survey of the extent of the mineral, of which several million tons is indicated by present exposures. The initial reduction is to about ¾ in., the product then passing to a belt conveyor, by which it is carried to a storage bin, and thence to a fine crusher for reduction to about ½ in. The washing plant consists of a four-unit conveyor operating in troughs, up which the material passes, counter-current to a supply of liquor that is kept saturated in sulphate but undersaturated in chloride. This liquor is removed as concentration is reached; and a byproduct, glaubers salt, is produced by fractional crystallization. The mother liquor passes to evaporation ponds, the crude salt from which may eventually find a market. The consumption of water in the washing plant amounts to about 1,000 gal. per hour.

The sulphate crystals from the washers are drained by passage over a perforated conveyor and pass to an 8x50-ft. rotary, oil-burning drier, equipped with baffles and exhaust fan. The dried product, which analyzes about 98 per cent pure, is elevated to storage bins, from which it is drawn to motor trucks for conveyance to the railroad at Clarkdale, Ariz. A spur line to the plant is expected to be built in the near future.



Upper left—Primary Crushing Plant
Lower left—Western Chemicals Washing Plant
Right—Drier, Elevator and Storage Bin

Why Caustic Solutions Make Steel Brittle

Causes and Mechanism of Failure of Steel Containers Subjected to the Action of Hot Caustic Solutions

By R. S. Williams and V. O. Homerberg

Associate Professor and Instructor in Metallography and Babcock & Wilcox Fellows at Massachusetts Institute of Technology

THE continued use of natural or treated waters containing sodium bicarbonate often leads to an abnormal type of failure in boiler steel. These failures are characterized by the appearance of intercrystalline cracks in the riveted joint areas. In the course of an extended investigation of failures of this kind, carried out at the suggestion of the Babcock & Wilcox Co. and with the company's co-operation, certain results have been obtained that seem to be of sufficient importance to justify advance publication before the investigation is completed.

The fact that mild steel is made distinctly brittle under the influence of cathodic hydrogen has been

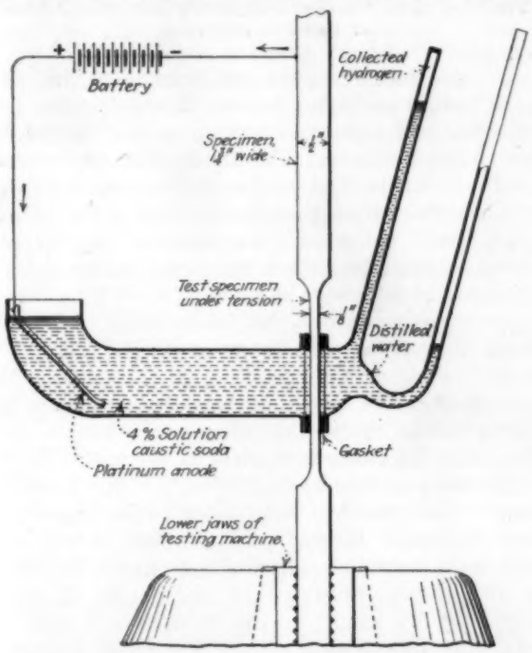


Fig. 1—Tensile Test Bar and Apparatus Used in the Study of Hydrogen Penetration

known for some time. The presence of cathodic hydrogen in practice is of course due principally to the electrolytic couples that exist where two pieces of metal are in contact. In the investigation described an external electromotive force is applied for the artificial production of increased quantities of cathodic hydrogen.

The actual effect of cathodic hydrogen on mild steel was strikingly shown experimentally. A study was made in the rate of penetration of cathodic hydrogen on a flat tensile test bar, first when clamped in a tensile testing machine without load, and second, as increasing loads were applied until the yield point was passed. The effects on the microstructure were also noted.

A paper presented before the Boston Chapter of the American Society for Steel Treating.

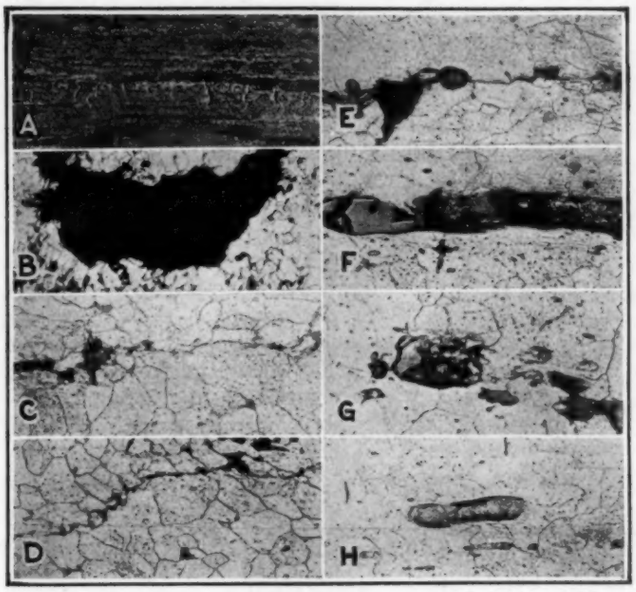


Fig. 2

A—Macrograph of blister cavities. ×3.
B—Photomicrograph of blister section. × 75.
C, *D* and *E*—Intercrystalline cracks in test bar. × 250.
F, *G* and *H*—Partly and completely altered slag inclusion. ×250.

The apparatus that was used is shown in Fig. 1 and was designed by A. Ortiz and modified by Dr. C. Nusbaum. The receptacle at the left contains a 4 per cent solution of caustic soda, which solution is in contact with one side of the test bar. The glass vessel at the right side of the tensile test bar contains distilled water, which is in contact with the other side of the bar. The caustic solution and the distilled water were both protected from carbon dioxide from the air by means of U tubes (not shown in the figure), which were filled with soda lime. The quantity of the caustic solution was accurately measured. The test bar was made the cathode and a platinum wire in the caustic solution the anode. The gaseous hydrogen collected in the distilled water was measured to determine the penetration through the specimen of the cathodic hydrogen produced at the surface in contact with the caustic solution.

The study of the penetration extended over a period of about a month, during which time readings were taken at regular intervals, before the bar was loaded, while loaded below the yield point, at the yield point, and above the yield point. The specimen was finally broken and sections were prepared for microscopic examination.

The difference in the rate of penetration of the test bar when in the unstrained and in the strained condition was quite marked, but stressing beyond the yield point did not appear to have any further effect on the rate of penetration.

Several interesting observations were made. A black deposit formed on both sides of the test bar. Also, rather large masses of black material were obtained on the distilled water side. Furthermore, the distilled water had a strong odor of hydrogen sulphide when the apparatus was disconnected. Chemical tests indicated that the deposit was probably iron sulphide.

The specimen broke with a dull sound. A number of blisters had formed on the side of the caustic solution and in the direction of rolling of the material. These blisters on polishing for microscopic examination

showed crescent-shaped cavities as shown in Fig. 2, *A* and *B*. Intercrystalline cracks are shown in micrographs, Fig. 2, *C* and *D*. A crack, which developed from one terminus of a blister, is shown in micrograph, Fig. 2, *E*. Partly and completely altered slag areas are shown in Fig. 2, *F*, *G* and *H*. From these observations two important points are made clear: that the cracks mentioned in the first paragraph are truly intercrystalline cracks and that the slag included in the steel undergoes a chemical change.

A similar experiment was made on a second test bar. The action of cathodic hydrogen extended over a period of several weeks, during which time the stress on the specimen was gradually increased. The specimen was removed from the holder after the yield point had been passed, and was prepared for microscopic examination. Again, partly and completely decomposed slag inclusions and many intercrystalline cracks were visible. The rate of penetration of the hydrogen through the steel increased as the tensile stress was increased, reaching a maximum when the yield point was passed. In each instance, immediately after the stress was applied, the rate of penetration markedly decreased. This decrease was especially marked immediately after the yield point was passed. A tentative explanation of this is that the capillaries produced by the combined effects of stress and the action of cathodic hydrogen on the minute inclusions become filled with debris, the action being most marked at the yield point where actual slippage occurs. Hydrogen sulphide was again detected in the distilled water, thereby suggesting the possibility of the reduction of the sulphide in the steel by the penetrating hydrogen. This conclusion is not

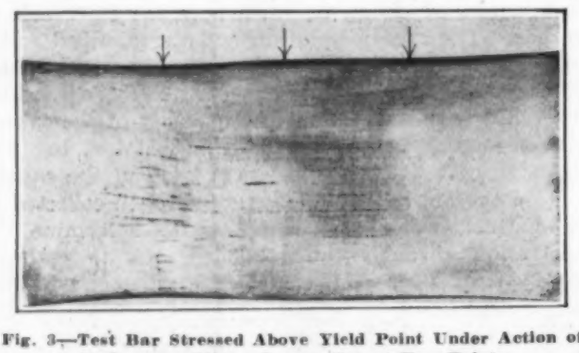


Fig. 3—Test Bar Stressed Above Yield Point Under Action of Hydrogen. Shows Contraction at Two Points

positive, however, since sulphur was found in the gutta percha gaskets with which the specimen was held tightly in contact with the glass receptacles.

A marked effect of the action of cathodic hydrogen was noticed as the breaking load was approached. A necking occurred at points just outside of the part exposed to the action. The contrast in the ductility of the affected and the unaffected parts is shown in the accompanying illustration, Fig. 3.

Many bits of evidence in this and earlier experiments indicated an actual reduction of the slag under the influence of cathodic hydrogen. A series of studies was begun to determine the actual effect of cathodic hydrogen on slag as present in iron and steel. Wrought iron containing considerable slag of the duplex type (containing two micro-constituents) was subjected to the action of cathodic hydrogen. The slag masses showed a bluish gray constituent and a darker or dove-colored one. The lighter constituent was readily reduced. Micrographs (Fig. 4) show the appearance of the slag areas before and after the action.

A long slag streak in mild steel, the same material from which the tensile test bar referred to above was made, was acted upon by cathodic hydrogen. The reduction was very rapid.

The chemical composition of the slag in the wrought iron and in the mild steel could not be determined accurately, and as the experiments with the wrought iron showed the action of the cathodic hydrogen to be selective, a series of experiments was made for the purpose of studying the effect on inclusions of definitely known composition artificially introduced into mild steel.

Iron and manganese sulphides and oxides were introduced into specimens and the latter were then forged.

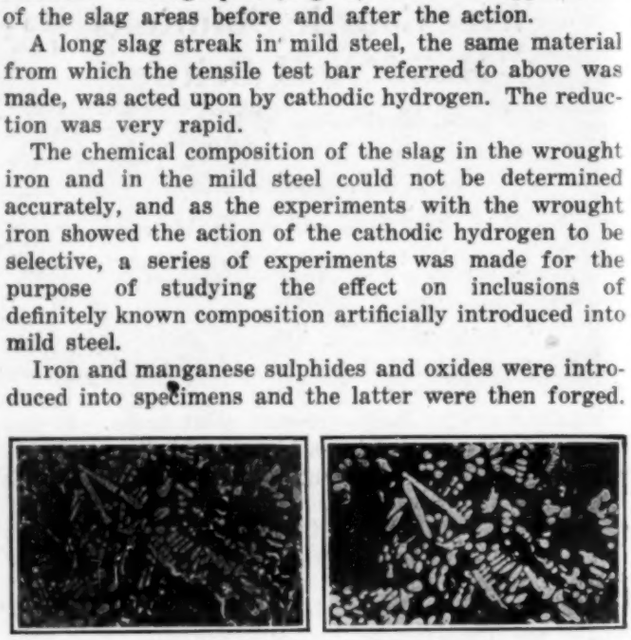


Fig. 4—Slag in Wrought Iron Before and After Action of Cathodic Hydrogen

Micrographic sections were cut from these and photographed before and after being subjected to the action of cathodic hydrogen and boiling caustic solutions of various concentrations. The changes in appearance of the different inclusions under the various treatments showed the degree of chemical action on the inclusion in each case. A typical comparison, Fig. 5, shows the same sulphide inclusions before and after treatment with boiling caustic soda.

These experiments on artificial inclusions proved conclusively that iron oxide is more readily attacked by cathodic hydrogen than any other of the common inclusions and that the sulphides are the inclusions most readily attacked by boiling caustic solutions.

The action of cathodic hydrogen on oxides is strikingly revealed in macrograph, Fig. 6. The material is bessemer steel that had been rejected because of high oxygen content. It was photographed after its exposure to the action of cathodic hydrogen. The blisters were undoubtedly produced by the action of cathodic hydrogen on the oxide, as the reduction of iron oxide (FeO) and the production of water is undoubtedly accompanied by an increase in volume. Blisters of this character were first observed with wrought-iron specimens that had been subjected to the action of cathodic hydrogen. These blisters always occurred in the direction of rolling and microscopic examination showed that they were produced at the slag inclusions.

A study was undertaken of actual boiler plate from boilers that had failed in service, the analyses of which came within specifications in each case. These failures generally occurred in cases where the water supply was considerably alkaline. The results will be published in the near future.

The facts described above—that is, the reduction of oxides by cathodic hydrogen and the removal of sulphides by caustic soda solutions—lead directly to an understanding of two of the factors involved in the intercrystalline cracking in steel. As molten steel solidifies, the impurities are to a great extent rejected

to the grain boundaries, so that much of the iron oxide and any iron sulphide that may be present would be found in places where their removal would tend most strongly toward a weakening at the boundaries. This effect would be aggravated if the steel was under tension, as is general in the case of boiler plates and in rivets. Wherever tension exists, very small capillaries must be formed as a result of the lack of adhesion between the inclusions and the metal itself. The cathodic hydrogen would produce water as the result of the reduction of iron oxide and cause an increase in volume at the grain boundaries. This increase in volume would have a tendency to force the grains apart. If to the stresses already present in the steel are added these stresses, the total may be sufficient to produce very small cracks. Such action would be especially marked

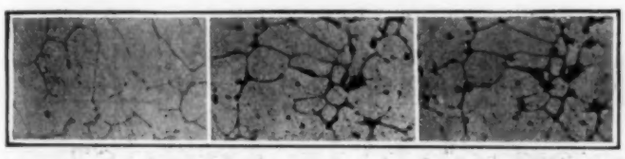


Fig. 5—Effect of Caustic Soda on Artificially Introduced FeS
The specimen at the left is unetched. Those at the right of it have been subjected to the action of boiling caustic for several hours.

at the rivet holes in a boiler where the stresses are at a maximum, the stress at the edge of a circular hole being approximately three times the average stress.

Moore and Beckinsale (*Journal* Institute of Metals, No. 1, 1921, vol. 25) have shown that when copper, containing the copper-copper oxide eutectic at the grain boundaries, is annealed in a reducing atmosphere, intercrystalline cracks are produced due to the reduction of the copper oxide. The resulting water vapor exerts sufficient force to produce a separation of the grains. Copper free from oxide will not behave in this manner. Since cathodic hydrogen will give at room temperature results produced only at an annealing temperature when molecular hydrogen is used, it is probable that the effects produced on iron at boiler temperatures, approximately 200 deg. C., with cathodic hydrogen are similar to those found with copper and molecular hydrogen at the annealing temperature.

The theory that capillary tubes are produced at the grain boundaries due to the lack of adhesion between

Fig. 6—Blisters on Steel, Produced by Cathodic Hydrogen

the matrix and any impurities that may be present is substantiated by the following case. A large piece of brass tubing about 10 in. in length was subjected to the "season-cracking" test. The tube, although immersed in mercurous nitrate solution to a depth of only 1 in., cracked throughout its entire length. The entire fracture was coated with mercury.

The results obtained lead to the following conclusions with regard to the intercrystalline cracking of steel under the influence of caustic solutions:

(1) During the crystallization of steel, the impurities, to a considerable extent, are rejected to the grain boundaries.

(2) The oxides and sulphides are two of the prime factors in caustic embrittlement.

(3) The oxides are reduced under the influence of cathodic hydrogen.

(4) The sulphides are removed due to the action of hot caustic soda solutions..

(5) The removal of the sulphides produces a surface condition favorable to progressive corrosion.

(6) Assuming that progressive corrosion starts with the removal of the sulphide, the corrosion will be greatly accelerated if the material is stressed. Furthermore, when the steel is under tension there is a tendency for the matrix to pull away from the inclusions at the grain boundaries and in this manner to produce small capillaries into which the corroding solution can penetrate.

(7) In stressed areas containing oxides, the volume increase due to the reaction with cathodic hydrogen may produce stresses which, added to those initially present, may cause cracking.

(8) It seems evident that hydrogen acts in three ways to produce embrittlement; first, the temporary brittleness caused by adsorbed hydrogen (as in acid pickling); second, it acts to reduce oxides; and third, its effect due to the change in volume at the grain boundaries, resulting because of the production of water. This latter volume increase would create a stress which, added to those originally present, may cause cracking, especially at those points where these stresses are at a maximum.

Acknowledgment is made to Messrs. Zavarine and Yarotsky for assistance given and especial thanks are due Prof. C. L. Norton of the Massachusetts Institute of Technology for his interest and co-operation.

Use of Fuel Briquets Grows

The production of fuel briquets increased in 1923, and a new high record was established. Reports to the Geological Survey show that the total output was 696,810 net tons, an increase over production in 1922 of 77,385 tons, or approximately 12 per cent. This increase may be largely attributed to improvement in demand for briquets in the Eastern States, which resulted in an increase of 48 per cent in the output at plants in that territory. Production increased slightly in the Pacific Coast States, but in the Central States, where the largest increase in 1922 occurred, there was a decrease of 5 per cent.

Of the fourteen plants that operated, five used anthracite culm or fines, two semi-anthracite, two a mixture of anthracite fines or culm and bituminous slack, one semi-bituminous slack, one bituminous slack, one a mixture of bituminous slack and sub-bituminous coal, and two carbon residue from the manufacture of oil gas.

The total quantity of raw fuel used was 682,490 net tons, an increase of 11 per cent over the quantity used in 1922. Of the total, 49 per cent was anthracite and semi-anthracite, 33 per cent semi-bituminous and bituminous slack, and 18 per cent sub-bituminous coal and oil-gas residue.

All plants that were in operation in 1922 were active in 1923 except the Clinchfield Carbocoal Corporation, at South Clinchfield, Va. The plant of the Virginia Fuel Corporation, at Norfolk, Va., began active operations and reported production on a commercial scale.

Gathering of T.A.P.P.I. at the Commodore for Ninth Annual Banquet

Paper Technologists Discuss Recent Developments in Industry

Men Who Have Been Responsible for Progress of Pulp and Paper Industry Exchange Notes—Second Annual Paper Industries Exposition

EDITORIAL STAFF REPORT

THE paper and pulp mills of both the United States and Canada were well represented by members of T.A.P.P.I. in attendance at the Ninth Annual Convention of this association held during the past week in New York City. Several other groups of men interested in other phases of these industries convened at the same time, thus making the composite gathering one of the greatest in the history of the paper industry. The Second Annual Paper Exposition, also held during the week at Grand Central Palace, undoubtedly furnished an added inducement to visit the metropolis.

The opening session of the Technical Association was devoted in large measure to the progress reports made by the committees on waste, light, heat and power, soda pulp, coated paper, testing materials, sulphite pulp, mechanical pulp, abstracts and bibliography, cellulose and vocational education. This year as last very keen interest centered in the vocational education committee's report. Several mills have undertaken to develop courses on paper and pulp manufacture based on the texts published through the efforts of members of the association. B. T. McBain, of the Nekoosa-Edwards Paper Co., reported definite improvement in the work of a large number of employees who have taken the course that has been given there. It was stated that in Canada some difficulty has been experienced because many of the workmen do not speak English. Two general conclusions apparently resulted from this discussion: that the management must stand firmly behind the work if it is to be encouraged at all and that ordinarily some fairly concrete promise of advancement for successful completion of the prescribed study must be offered.

The report of the committee on waste, headed by R. B. Wolf, indicated that the work that has been carried on regarding the elimination of white water, broke and bark losses and likewise that looking to the development of greater intraplant transportation efficiency have been carried to a point where the status of these problems is clearly established. White water must be re-utilized at every possible point, a save-all installation made and as little fresh water as possible used if the amount of fiber lost is to be made a minimum. In discussing save-all equipment it was brought out that widely varying results have been obtained in conserving white water fiber at various mills. For this reason Dr. John D. Rue, of the Forest Products Laboratory, is to send out a questionnaire to the mills interested in the problem. Related data will be compared and standards of good practice established. In this discussion it was emphasized that the prospect of legislation prohibiting stream pollution with mill wastes makes the problem doubly significant at the present time.

Bark refuse must be approximately 50 per cent dry to burn economically. Beyond proper furnace design, largely determined by the desirability of using the same furnace on other fuels at times, the factors of air supply and method of feeding are considered most significant. J. D. Rue and E. P. Gleason, making a final report on this phase of the waste committee's work, state that the three most likely types of furnace for this operation are the hanging arch type, with constricted outlet; the type with expanding throat between the furnace proper and a secondary combustion chamber, and the Dutch oven type, characterized by provision for the continuous application of some coal by means of an underfeed stoker.

The possibility of drying paper on a commercial scale in a vacuum drier was outlined by Ogden Minton, who for some years has been engaged in the develop-

ment of apparatus for this purpose. On the ordinary machine, drying is accelerated by the utilization of the highest temperature that will not injure the fiber (or correspond to a pressure the use of which in drying rolls would be hazardous), by blowing air over the drier stacks and eliminating the moisture-laden air. Mr. Minton pointed out that this process is inefficient thermally and that its shortcomings become pronounced as machine speed is accelerated. For the vacuum method he claims a thermal efficiency of close to 100 per cent, greatly decreased space requirement and more adequate control of the process. No air being present to conduct heat away, the only losses from the vacuum drier are said to be by radiation from the cast-iron base of the machine. The conditions recommended for operation are 28 in. of vacuum when the temperature of drying will be 100 deg. F. with steam inside the rolls at a pressure of 5.3 lb. Despite the fact that the new development has not emerged from the semi-commercial scale as yet, considerable optimism was evidenced by some members in its possibilities.

In a further discussion of drying that was aimed to establish the amount of heat that should be required for the operation under careful management with the usual drying rolls, a large variation in the amounts used at different mills was disclosed. The figures below are for newsprint mills and are significant in that they represent the results of one of the first systematic endeavors of the association to throw light on an operation that is at the same time expensive and essential to satisfactory production.

Total Overall Heat Units Used per Lb. Water Evaporated from Sheet	Water Evaporated per Sq.Ft. Effective Drying Surface per Hour	Paper Dried per Sq.Ft. Effective Drying Surface per Hour	Steam per Lb. Paper Dried
1263	3.659	1.564	4.025
2030.8	3.301	1.462	4.66
1224.6	2.61	1.11	3.4
1067	3.2	1.288	3.02
1370.7	1.703	1.022	2.478
1283	1.93	1.04	2.567
1390	1.53	0.98	2.28

Logical Methods of Lime Sludge Disposal

The committee on soda pulp devoted its time largely to a discussion of methods for lime sludge disposal and for continuous causticizing. In the former connection G. K. Spence, chairman, pointed out three outlets for this material—namely, finely divided lime mud carrying about 50 per cent of water and a small percentage of free caustic. It may be dried, then burned and sold as agricultural lime, it may be dried and refined to be sold as whiting or it can be burned for re-use in the mill's own caustic-making plant. Figures were presented to show that the possible net profit in turning out agricultural lime is not sufficient to make this method worth while unless a constant and ready outlet for this product exists at the mill. Likewise the margin in producing whiting is low due to the difficulty of purifying it sufficiently for the trade. Mr. Spence concluded that a pulp manufacturer who pays more than $8 per ton for lime and not more than $5 per ton for coal will show a good profit from an installation for reburning lime for his own use.

A discussion of methods for reburning followed in which the relative merits of powdered coal, oil and producer gas were discussed. W. D. Mount maintained that these fuels increased in desirability in the order given above—that the use of coal gave a dark product with about the same heat efficiency as producer gas. It was said, however, that the color had little effect on its subsequent use in the caustic-making system.

The adaptation of the continuous causticizing system made by the Glamorgan Pipe & Foundry Co. to the pulp industry's requirements was outlined by Mr. Mount, who described the new plant of the Penobscot Chemical Fiber Co. at Old Town, Me., as an example of what can be accomplished. Claims made for the new system include improvement of caustic room working conditions, decreased steam consumption, lowered losses of alkali, higher caustic strength and decreased power consumption.

Another matter that was informally discussed was the use of continuous vacuum filters in washing soda and sulphate pulp. Mr. Morrison, of the Oliver Continuous Filter Co., stated that froth trouble has interfered in experiments to date in using the filter on sulphate pulp, but reported that the use of such filters on soda pulp has been carried to the point where commercial operation is economical. He stated that liquor coming from the digesters at a gravity of 11.5 Bé. was being lowered to 9.7 in washing the pulp free from soda. The loss in soda in this operation has been lowered to 4 to 5 lb. per thousand pounds of air-dry pulp handled. It has been found further that plunger rather than centrifugal pumps should be used in handling the pulp before the washing operation.

Developments in Sulphite Production

Two of the innovations in cooking practice that have been followed by the committee working on sulphite pulp, headed by R. A. Hayward, are that in which zinc dust is added and that in which the heat and gas from the relief of the digesters is reclaimed. One mill is now cooking with neutral sodium sulphite—another development that is being watched with interest.

One of the outstanding papers considered at the meeting of this section was by G. P. Genburg, on "The Cooking of Sulphite Cellulose." Comparative data on production efficiency obtained through a study of different methods in various countries made possible several definite conclusions. In interpreting these it is necessary to note that the Rittner-Kellner and Mitscherlich methods use a cooking time of about 16 hours and that the digesters used are heated indirectly. The ordinary American or quick cook method uses a cooking period of half this time and employs direct steam for heating. Another difference rises in the care with which wood is aged for cooking by the foreign methods. These facts are reflected in the following summary made by Mr. Genberg:

1. The same yield of strong pulp per cu.ft. of digester space is obtained in the quick cook mills on this continent when spruce is cooked as in the Ritter-Kellner mills in Sweden and Finland.
2. A lower yield of easy bleaching pulp is obtained in Finnish and Swedish Ritter-Kellner mills cooking spruce than in quick cook mills on this continent cooking the same kind of wood.
3. A lower yield of both strong and easy bleaching pulp is obtained from a mixture of spruce and fir than from spruce alone.
4. Lower yield of strong pulp by 23.5 per cent is obtained from hemlock than from spruce.
5. Lower yield of easy bleaching pulp by 23 per cent is obtained from hemlock than from spruce.
6. In the light of tests made the Mitscherlich process does not give higher yield of pulp from the wood than the direct cooking methods.
7. In case of strong pulp the production efficiency is:
   (*a*) 14 per cent higher for Ritter-Kellner mills than for Mitscherlich mills.
   (*b*) 78 per cent higher for quick cook mills cooking hemlock than for Mitscherlich mills cooking spruce.
   (*c*) 100 per cent higher for quick cook mills cooking spruce than for Mitscherlich mills.

Random Photographs Taken at the Exposition, Showing Nature of Displays

At left a working model of the Briner economizer for attaining maximum thermal efficiency on drying rolls is shown. The center cut shows Dard Hunter making paper by hand in the "good old fashioned way" with the apparatus that was used in Revolutionary days, while on the right a type of continuous save, all that has come into use during the past year is pictured.

8. In case of easy bleaching pulp the production efficiency is:

(*a*) 16 per cent higher for Ritter-Kellner mills cooking spruce than for Mitscherlich mills.
(*b*) 68 per cent higher for quick cook mills cooking hemlock than for Mitscherlich mills cooking spruce.
(*c*) 114 per cent higher for quick cook mills cooking spruce than for Mitscherlich mills.

9. In other words, where a quick cook mill cooking spruce is using five digesters to turn out a certain production, a quick cook mill cooking hemlock must use six, a Ritter-Kellner mill nine, and a Mitscherlich mill ten digesters, in order to turn out the same production.

10. The yield of strong pulp per cord unbarked spruce is higher in quick cook mills on this continent than in the Mitscherlich mills, and Ritter-Kellner mills in Sweden and Finland.

11. When cooking a mixture of spruce and fir, less yield per cord is obtained than when cooking spruce alone. When cooking hemlock 15 per cent less yield per cord is obtained than when cooking spruce.

12. In cooking easy bleaching pulp 7 per cent less yield is obtained than when cooking strong pulp.

13. When burning pyrites, the sulphur consumption is higher than in case of sulphur burning.

14. Twelve to 18 lb. more sulphur per ton pulp is consumed in the Ritter-Kellner process than in the Mitscherlich process.

15. When cooking spruce 21 to 30 lb. more sulphur per ton pulp is required in the quick cook process than in the Ritter-Kellner process.

16. When cooking a mixture of spruce and fir 20 to 25 lb. more sulphur per ton is required in the quick cook process than when cooking spruce only.

17. When cooking hemlock 35 to 45 lb. more sulphur is required in the quick cook process than when a mixture of spruce and fir is cooked.

18. Eleven per cent higher sulphur consumption is effected in cooking easy bleaching pulp as compared with strong pulp.

19. The steam consumption in the direct cooking process is higher than in the indirect process.

20. The steam consumption increases with the decrease of the yield from the species of wood cooked.

The work that R. N. Miller and W. H. Swanson have continued to carry on at the Forest Products Laboratory on sulphite has resulted during the past year in showing that temperature has greater influence on the cooking action than has acid concentration. Changes in temperature that are commercially possible are of greater influence than any acid concentration changes within the ordinary range of commercial practice. Moreover in the usual process of cooking the relations among pressure, temperature and acid concentrations are such that the beneficial effect of increases in acid concentration are largely offset by pressure and temperature limitations, so that temperature is left as the dominant factor in controlling the progress of the reaction. It was found that the lowest average temperature that will give the requisite purification in the necessary length of cook will produce the best quality of pulp.

The discussion following the presentation of these papers brought out that Mr. Genberg's conclusions while of value could not well be accepted as final due to the fact that the data used could not in all cases be very well compared. B. S. Summers expressed the belief that Mitscherlich pulp can be produced in quick cook digesters, that the method of process control is more significant than the process itself. Comment of several members on the Forest Products work was to the effect that if this can be carried to the point where the effect of other factors can be studied independently there is little doubt that it will be possible to make profitable changes in American cooking practice. The difficulty of weighing and accurately sampling chips to the digesters was emphasized as a great drawback in obtaining actual mill data that would allow scientific control of the process.

Utilization of Decayed Wood

During the past year work has been done at the Forest Products Laboratory on the utilization of decayed wood. J. D. Rue, in charge of this work, discussed the possibility of making use of material that has formerly been culled and left in the forest. The conclusions reached indicate that pulp entirely satisfactory for newsprint production may be made from infected wood with yields only slightly lower than those usually obtained with good wood. While the color may not be so bright as would be obtained through the use of perfect wood no other serious difficulties in the way of utilization were found. Firmness rather than density was found to be a significant indication of the wood's value for pulping.

With the rapid growth of the newsprint industry considerable discussion as to the most efficient type of pulp grinder has taken place. W. A. Munro, as chairman of the committee on groundwood, has made a study of various available machines with the result that definite conclusions can be drawn. Comparing the pocket type with the magazine type it was found that the magazine grinder using 4 ft. wood is much more economical in labor cost per ton than the three-pocket type

of pocket grinder on 2 ft. wood producing less than 7½ tons to a stone per 24 hours. The saving in labor over this 2-ft. type is so much that it more than overbalances the increased stone cost of the magazine type and higher power cost per ton. This higher power cost is due to the fact that more power is required on the magazine type to grind a ton of pulp than in the pocket type.

The difference in costs is not so great and rapidly disappears as the size and production of the pocket grinder increases. With a production over 7½ tons to a stone and up to 10 tons there is but little difference in the labor cost, the higher labor cost of the pocket grinder being largely offset by greater initial cost, higher stone and power costs of the magazine type. Over 10 tons to a stone the larger type of pocket grinder is more economical in every way than the magazine type.

Many Attractive Exhibits at Exposition

The Second Annual Paper Industries Exposition, held throughout the week, proved to be fully as attractive as its forerunner held a year ago. Again the story of paper manufacture was told through appropriate displays carrying the process from the raw material stages to a multitude of finished products—including imitation leather for binding purposes, paper clothes, containers for a variety of food products and paperglas as well as an almost infinite variety of such standard products as wrapping, glassine, tissue, bond, ledger and coated specialty papers. The chemical engineer visiting the show must have noted an increase in the standard unit process equipment on display over last year. These exhibits in part included suction filters, a continuous thickener, rotary and vibrating screens, mixing and agitating devices and air conditioning apparatus.

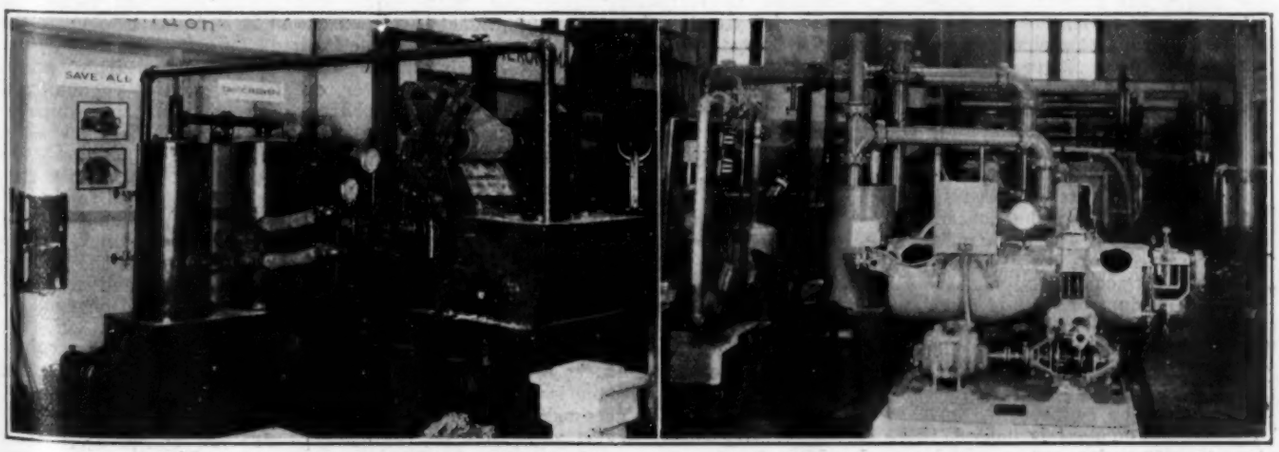
Altogether there were about 100 displays. Segregation into groups was made as far as the nature of the exhibits would allow, thus making it convenient for visitors to concentrate their time at points of major interest. Again evidence was plentiful that moving machinery, model or full scale, exerts a strong attraction for those in attendance at such an affair. To review but a few of the exhibits of this nature such devices could hardly be overlooked as the American Voith Contact Co. demonstrated to indicate the operation of a modern magazine pulpwood grinder, and of pressure feed for high-speed paper machines. The Valley Iron Works pointed out the merits of the Niagara beater in the same way. The Dorr tray save-all, the Oliver filter, the Westinghouse unit drive apparatus for paper machines, Bird screens for refining pulp, the General Electric model of an electrically heated boiler, Sandusky bronze castings for couch rolls and the Nash pumps were doubtless among the features of the exposition from an engineering point of view. Although these particular exhibits did not reflect any outstanding advances for the industry from an equipment standpoint during the past year, still they served to keep before the engineers in the industry the last word in the utility of apparatus hitherto used for processes in other fields. For instance, the continuous filter has found a new application in washing soda, electrically generated process steam has come to be a practical reality in the industry, and use of the more efficient save-all equipment is definitely on the increase.

The mechanical end of upkeep and operation of pulp and paper plants received liberal attention on the part of manufacturers of lubricants, belting, bearings and recording instruments. As usual SKF presented a somewhat uncanny evidence of the efficiency of ball bearings, the latest being a ball traveling at a sturdy pace on a horizontal circular groove, without impetus and seemingly without deceleration. Goodyear told a different story, showing rubber-lined bearings operating under water with no other lubrication than a dosage of sharp sand.

Of the educational exhibits one of the most attractive was that provided by the Western Paper Makers' Chemical Co. Dard Hunter, famed as a maker of hand-molded paper, demonstrated with appropriate apparatus how paper was made at the time of the revolution. Just across the aisle was a bronze couch roll for a machine to make newsprint 19 ft. wide at 1,000 ft. per minute!

The Seaboard Air Line aimed to indicate the possibilities for the paper industry in the South. Beyond pointing out that 40 per cent of our wood is grown there, samples of bleached sulphate made from gum and from pine were distributed as evidence of what has been accomplished at Forest Products Laboratory with these woods. Clays, limestone and other papermaking materials native to the region below the Mason-Dixon line were also included to round out a very informative exhibit.

The consensus of opinion indicated that this year's show was fully as good as last and that the exhibits in many cases were better organized.



Heavy Chemical Engineering Equipment Demonstrated to Paper Men

The continuous filter shown on the left is a small section of a type that has come into use in washing soda pulp while the pumps on the right are of a modern and efficient design for vacuum maintenance through the application of centrifugal force.

Equipment News

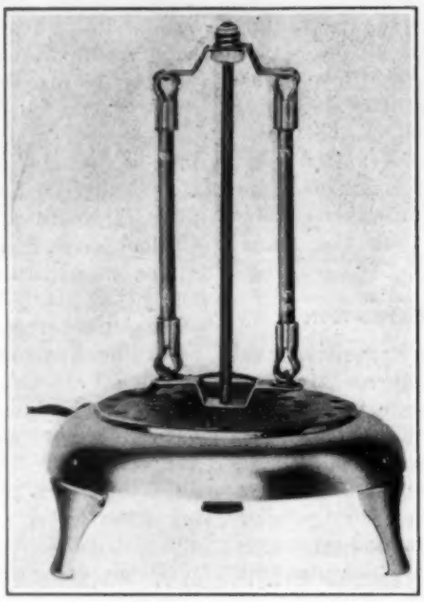
From Maker and User

Electrical Heating Resistor

New Device of Interest to Users of Electricity as a Source of Industrial Heat

A new non-metallic resistance element for producing electrical heat, called the "Globar," has recently been placed on the American market by the Wireless Resistor Co. of America, Milwaukee, Wis. This element is made up of silicon carbide, in part, and somewhat resembles carborundum. It is made up in round bars and is mechanically strong and rigid regardless of the temperature applied.

The makers claim long life for the material when operated at high temperatures, tests having shown a life of 1,000 hours continuous service at temperatures as high as 2,400 deg. F. It is also claimed that, when properly proportioned (as to mixture of ingredients), the specific resistance can be made higher than that of any metallic resistor, thus permitting a greater concentration of heat in any given space. The material is also non-inductive and expansion need not be considered when mounting.



Two Globar Heating Elements in Mounting

The material in the heating portion of the Globar element will withstand high temperatures. There is an initial change in the resistance of the element at high temperatures. This change in resistance is low at 1,800 deg F., depending upon the composition of the particular element, after which the temperature remains practically constant. Above 1,800 deg. F., the initial increase in resistance is greater as the operating temperature increases. At temperatures up to 2,400 deg. F., the material is satisfactory for continuous operation by applying proper voltage, with regulating transformers or resistances. It is possible, however, to heat the element up to 3,000 deg. F. for short periods without deterioration of the structure. However, over 2,400 deg. F. is not recommended, as this will shorten the life of the element and cause serious change in resistance.

The value of this element, especially when used as a source of high temperatures, depends to a great extent upon the successful production of terminals of high conductivity; for where a high temperature resistance element is in contact with metal, the metal heats up, and arcing occurs, which rapidly deteriorates the contact. Terminal portions of the element are specially treated for the purpose of increasing the conductivity thereof, so that a minimum of heat is produced at these terminals, and the latter may thus remain at a satisfactory low temperature during the operation of the heating element at high temperatures with metal line connectors.

When the element is heated, there is a temperature drop of several hundred degrees in a relatively short distance at the terminals. It is therefore necessary that the material of this element have a very small temperature coefficient of expansion. This is accomplished by the proper selection of corrective materials. In addition to the fact that the terminals of the element are of relatively good conductivity, it is a further point of advantage that the physical characteristics of these terminals are such that they will withstand great pressure from the contact clamps. This permits of a rigid connection and a contact of low resistance.

Due to its low thermal coefficient of expansion, which, as a matter of fact, is principally zero, this material can be heated suddenly and as rapidly cooled with little danger of damage to the structure. These elements can be imbedded in refractory materials with none of the usual trouble experienced with metallic elements. Water poured over the element has no damaging effect, and none of the solids or liquids with which the element may come in contact in ordinary use have any deleterious effects upon the structure of the material.

Like most non-metallic resistance materials, the temperature-resistance curve of the material has a negative trend with increasing temperatures. The resistance decreases rapidly up to about 1,000 deg. F., then increases slightly up to about 1,800 deg. F., and finally drops above this temperature. Between the temperatures of 1,000 and 1,800 deg., the resistance is stable, and therefore it is not necessary to use a voltage-regulating device to protect the element. At other operating temperatures, however, and in cases where the element is confined so that the heat cannot be rapidly dissipated, it is desirable to control the voltage so that decreasing resistance may not cause undue increase in temperature.

Heating at high temperatures can be readily controlled by operating the element in series with a metallic element that has a decided positive resistance coefficient, or by the use of a regulating transformer that controls the voltage, or by the use of a temperature controller that operates on the "on and off" principle. The latter is applicable only to apparatus like ovens and furnaces, where the walls and heated parts hold enough heat to prevent rapid fluctuation of temperature of the material being heated.

This material is supplied in bars from 6 to 56 in. in length and from ⅜ to 1 in. in diameter. Standard voltages are 110-220-440, special voltages being provided for at request. Amperes and watts are as desired, depending on length and diameter of bar.

Handling Volatile Liquids

The Mauclere system of handling volatile liquids is being introduced for the first time in the United States by the Liquids Handling Corporation, 21 East 40th St., New York City. A sketch illustrating the operating principles of this system is shown herewith.

The system may be described as a development of the principles underlying the duplex displacement pump. One central pneumatic station, with reservoirs of pressure and vacuum, permits the simultaneous filling and emptying of an indefinite number of vessels. The valve operates automatically in cases where the object of the installation is to supply liquid under constant head at points above the storage level. For filling cans or drums when the same vessel is to be used for elevating the liquid and giving accurate volumetric measurement it is usual to operate the valve by hand.

A compressor draws air from one receiver, creating a partial vacuum, and discharges into another, in which it creates a pressure. The receivers are so proportioned that vacuum and pressure correspond respectively to the suction and pressure lifts called for in any given proposition. The volume of compressed air delivered per minute by the compressor corresponds to the volume of liquid that may be delivered per minute at the points of discharge. If this volume is not drawn off, the vacuum builds up until the inlet valves of the compressor no longer open. The compressor then runs light, as it would with an unloading device. The pressure also builds up, but soon reaches a maximum because of the limited volume

of air in the circuit. Liquid from an underground tank is therefore had under practically constant head without putting any pressure on the storage tank.

The sketch of the elevating unit is almost self-explanatory. The cylinder on the left is under pressure of air used and is discharging liquid through pipe *c*. In a few moments the float will reach the button on the rod, the switch will be thrown, and the contained air will exhaust into the vacuum receiver. The previously existing pressure will change to a partial vacuum and the same cylinder will refill through pipe *g*, Simultaneously the right-hand cylinder will open to the pressure receiver and the contained liquid will discharge without sensible interruption through *c*, It will be observed that the four check valves *d* are the only moving parts, except the float, that come in contact with the liquid.

The makers claim certain definite economies for this system in comparison with other continuous delivery systems now in use. As against the system of pumping compressed air into the storage tanks, even where such practice is permitted by law, the Mauclere system avoids the loss of time in getting up pressure. As against pumps operated by compressed air from a high-pressure receiver, the system avoids the loss of power involved in compressing to 125 or 150 lb. a considerable quantity of air where 12 or 15 lb. would suffice for most of the work that has to be done. As against water pressure systems it gives abundant power without the necessity for high stand pipes and without the risk of freezing in cold weather; it permits the handling of several kinds of liquid without serious complication of piping; and it may be used for motor fuels containing alcohol.

The system is in use for handling solvents at the French Government powder works at Bourges. It is also in use for handling sulphuric acid. Volatile acids, the vapors of which would attack metal, may not of course be drawn through a compressor. It is also in use for the handling of liquors and edible oils. The absence of all churning makes it desirable in propositions where an element of delicacy obtains.

In an installation now being built to handle carbon bisulphide at the mills of the Lyons Artificial Silk Co., the nature of the liquid handled has compelled deviations from the standard type of apparatus. The whole elevating apparatus, with storage tanks, is in a pit covered with water. The carbon bisulphide in each elevating cylinder is also covered with a protecting sheet of water, through which the pneumatic impulse is transmitted. Suction has been done away with and the system works by gravity compression alone. In this case a system of volumetric distributors, placed on the level of the mixer room, deliver such accurately measured quantities of the fluid as may be required for each operation.

In the case of flammable or oxidizable liquids, nitrogen or some other inert gas is used instead of air. Any permanent gas will meet the mechanical requirements, and as the gas moves in closed circuit, none of it is lost except by absorption or small unavoidable leaks.

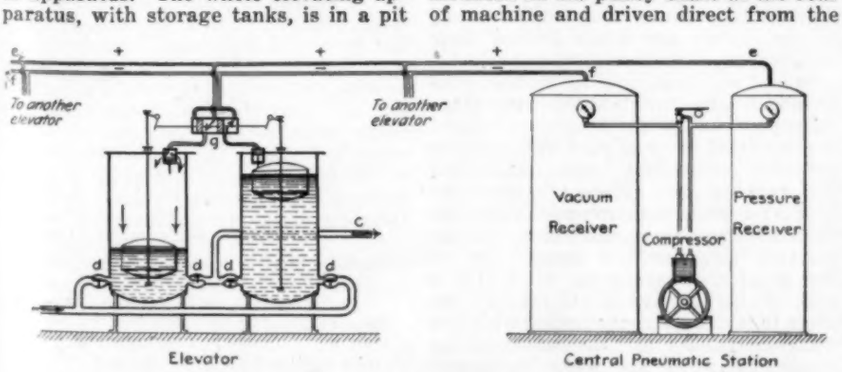
Being pneumatic, this system is necessarily of low mechanical efficiency as compared with modern pumps. It is therefore not recommended for steady pumping, large gallonage or high lifts, in which power economy is naturally the main desideratum. But for intermittent or complicated propositions involving lifts not over 75 to 100 ft. its promoters claim substantial advantages both in first cost and in economy of operation over other mechanical propositions. The more complicated the proposition the greater the advantage claimed.

Portable Pipe Machine

To meet the demand for a low-priced, portable pipe-threading machine, the Williams Tool Corporation, Erie, Pa., maker of pipe-threading tools, has recently placed on the market a small-sized, portable, threading, cutting and reaming machine for pipe work. This unit has, in addition, an attached grinding device and three built-in drives—motor, belt and hand. By the use of a flexible shaft, the machine will also operate hand stocks up to 8 in. diameter.

The machine complete weighs 520 lb. It cuts either right- or left-hand pipe threads on from ¼-in. to 2-in. pipe. It threads bolts from ⅜ to 1¼ in. in diameter. It will cut off pipe and bolts covering the same range. It will also ream the above sizes of pipe. The longest thread it will cut on one chuck setting is 10¼ in.

A rotary geared oil pump is provided for lubricating the work during operation. The grinding attachment consists of a high-speed emery wheel mounted on the pulley shaft at the rear of machine and driven direct from the motor. This permits convenient grinding of cutting tools and hence is a time-saver. The wheel runs at 1,100 r.p.m. and is 6 in. in diameter with a ¾-in. face.



System for Handling Volatile Liquids

Lubricated Acid Valves of Lead and Tin

Since the introduction of the Merco Nordstrom lubricated plug valve several years ago, its principle has become widely recognized as most effective in preventing troublesome sticking of valves, particularly on lines handling chemical products.

The United Lead Co. has just placed on the market Merco lubricated valves made of hard lead and pure block tin. The acid-resisting qualities of hard lead and block tin are thus combined with the non-sticking characteristic of the Merco design, giving a valve that will render unusual service on acid lines. These valves are provided with T-handles so that it is not necessary to use a wrench on them.

Correction

In the April 7 issue on page 557, a portable electric drill known as the "Speed Way" was listed as having been recently placed on the market by the General Electric Co. This was an error, as only the motor is manufactured by the General Electric Co., the drill being a product of the Electromagnetic Tool Co., Chicago.

Manufacturers' Latest Publications

Moore Steam Turbine Corporation, Wellsville, N. Y.—Bulletin 1928. A new leaflet on the Moore centrifugal pump.

The Industrial Appliance Co., Chicago, Ill.—A booklet entitled "Flour Catechism," giving facts concerning this company's system of flour maturing.

Marblehead Lime Co., Chicago, Ill.—A booklet that tells of the use of lime in water softening, with particular reference to chemically pure hydrated lime.

Illinois Zinc Co., Peru, Ill.—A leaflet on the use of corrugated zinc sheet for roofing and siding of industrial buildings.

The Calorizing Company, Pittsburgh, Pa.—A book entitled "Heat Enduring Castings," dealing with the subject of alloys suitable for the production of castings exposed to temperatures up to 2,100 deg. F.

Gardiner & Lewis, Inc., 30 Church St., New York City.—Bulletin 8. A bulletin on the protection of steel and concrete from acid gases, fumes, brine drip and corrosion generally.

Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.—S. P. 1690. A booklet entitled "High Voltage Porcelain Insulators, Their Design and Manufacture," containing useful information on this phase of ceramics.

Foamite-Childs Corporation, Utica, N. Y.—A booklet on a fire patrol made up of an Indian motorcycle with side car and Foamite-Childs fire-fighting equipment.

Power Specialty Co., 111 Broadway, N. Y. C.—Bulletin 241. A catalog on Foster heaters for petroleum refineries, giving much valuable information on the use of these pipe stills in oil refining, together with many useful data of general interest to engineers.

Steere Engineering Co., Detroit, Mich.—Pamphlet 261. A leaflet on the "Backrun" system of water-gas manufacture.

Allen Ashley, 152 West 42nd St., New York City.—A catalog of second-hand plant equipment for sale, including motors, gas engines, driers, welding outfit, tanks, hardware and various other items.

Readers' Views and Comments

An Open Forum for Subscribers

The editors invite discussion of articles and editorials or other topics of interest

Broadcast by Dr. Williams

DETROIT AERO METALS COMPANY

Manufacturers of
ALUMINUM, GLUCINUM, LIGHT ALLOYS
POTASSIUM CARBONATES and FERTILIZERS
617 LYCASTE AVENUE
DETROIT

April 2, 1924.

TO WHOM IT MAY CONCERN:
GREETINGS

It was an ancient custom between citizens or individuals, good, evil, crooked, drunkards, hypocrites and cowards, to give all a chance of hearing before convicting and crucifying. When they found him guilty, they spat in his face and then crucified him.

We are now living in the Twentieth Century, where our laws and social ethics are based on Justice and Equality. Where, when an individual is accused of a crime or any wrong doings, he is given a hearing and an opportunity to defend himself.

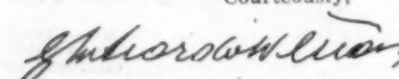
There appears to be living among us to-day, a class of individuals who do not adhere to either of these principles. These can only be classed as yellow cowards, crucifying their victims before seeing or hearing them.

Here I am in Uncle Sams uniform as a R. Officer in Chemical Warfare, who was crucified and home broken up without a hearing.

Show your colors and Americanism.

When you have fulfilled your desires according to "*YOUR CUSTOM*," return the photograph for my inspection.

Courteously,



GLEN. LENARDO WILLIAMS
DETROIT AERO METALS COMPANY

Glen Lenardo Williams

An Exchange of Telegrams

April 2, 1924.

H. C. Parmelee, Editor,
Chemical & Metallurgical Engineering,
McGraw-Hill Co.,
Tenth Ave. at 36th St., N. Y.

We have reprinted your article about Williams in our magazine. Williams states that man who wrote article has been fired. Also that man who wrote article demanded thousand dollars; also that same man once wanted to establish partnership with Williams in crooked deal in Philadelphia. Are any of these statements true? W. A. MARA,
Detroit Board of Commerce.

April 3, 1924.

W. A. Mara,
Detroit Board of Commerce,
Detroit, Mich.

All statements ascribed to Williams in your telegram April two are false. I personally wrote article and am still on job. Article was published without Williams' knowledge, consent or opposition and would not have been withheld for any price. Having never seen Williams nor talked with him, it is obvious I never proposed partnership of any kind. His whole story is preposterous. Evidence against him accumulating here. H. C. PARMELEE,
Editor, *Chemical & Metallurgical Engineering.*

Easy Money From Aluminum

To the Editor of Chem. & Met.:

SIR—On account of my previous experience with "Dr. Glen Williams" your article, "Easy Money From Aluminum," in your issue of March 24 interests me greatly. I first met this eminent scientist in 1916 while employed by the Baker Iron Works of this city on their engineering staff. Williams came to the shop in company with Hyman Schwartz, an attorney, well known here. Both were representing the Internal Dye Products Corporation, Williams as chief chemist and Schwartz as trustee. The object of their visit being to purchase machinery for the new factory of the Dye Corporation, they were referred to the writer and made known their wants.

Many and strange were the contrivances built for Williams and manfully paid for by the Dye Corporation. Among them were a steel still with an agitator, completely glass enameled, for making the "Neetro," whatever that is; a large cast-iron revolving furnace for the "Cyaneets"; and a drier for the "Litzreine." I heard much of the wonderful inventions of Williams and of his studies in Germany, but when to facilitate conversation with him we assigned a German-speaking draughtsman to his work he either knew no German or refused to speak it, so we carried on with signs and a sort of scientific jargon which usually meant very little.

It goes without saying that the Internal Dye Corporation was a dud and many people lost money, among whom were a Mr. Mossbacher and Mr. Levy, both connected with the Behrent-Levy Co., an insurance concern of this city.

I hope that the foregoing may be of interest to you and that it may be of use to help protect future investors in Williams' schemes. I shall be glad to give you dates, names and addresses of interested parties if you require them.

H. L. GLAZE,
Consulting Engineer.
Los Angeles, Calif.

Marked-Down Sales of Chemical Services

To the Editor of Chem. & Met.:

SIR—In the March 31 issue of *Chem. & Met.*, pp. 498 and 522, there were some comments on the munificent remuneration of the chemist. There has been much said on this topic, especially since the war, but most of the commenters fail to bring out the basic cause of the situation. The economics of the condition are lost in the general wail. The law of supply and demand functions in spite of the objections to the results.

The great demand for chemists at the time of the war and the publicity given to this demand and the probable continuation of this demand resulted in increased facilities in our colleges and universities for producing technical men. These facilities are today producing men faster than the natural increase of the industry and the death rate will permit this industry to absorb them. Therefore the condition is created in which the man is continuously seeking the job and the job is not hunting the man.

It is useless to rant and storm about the underpaid chemist unless the causes for the condition can be and are corrected. As long as there is a surplus of men trying to live by the chemical profession, prices will be cut. As long as some one is willing to render the service at the lower figure, that is the figure at which it will be rendered. Every purchaser of commodities or services secures what he wants at the lowest possible cost; even those most strongly urging that chemical service should be better paid do not hesitate to follow this procedure in general.

There has been much publicity given to the enormous returns derived by the leaders of the profession and nothing has been said in public of the insignificant return of the others. If some missionary work were done disillusioning the unsophisticated aspirants to fame and fortune via the chemical route instead of the usual trumpeting of the fortunes of the few (very few), some of the innocents would be deterred from entering the field, which would reduce the ratio of men to jobs and naturally have a material effect on this condition of which we hear so much.

A. E. MAZE.
East Orange, N. J.

To the Editor of Chem. & Met.:

SIR—Referring to your editorial on "Marked Down Sales of Chemical

Services" and the correspondence which inspired it, I should like to point out that there is another side to the question. It is a pretty sound economic law that everyone ends up by getting as much or as little value as he gives. It is another law that values decline as the supply increases. The supply of technically trained men is becoming pretty large these days, but the supply of men who can supply orginality and initiative in the use of technical knowledge is not so large. Technical knowledge is valueless without power behind it.

So long as the market is glutted with technical men who lack originality and initiative, just so long will there be companies that try to beat the game by hiring technical men at ridiculously low salaries. They get just as little as they offer. Why worry?

When men get to the point where they have to knock about their pay, it is time for them to get into some other line of work. Why not try carpentry or blacksmithing, where the use of a hammer counts for something?

LEO G. HALL.

Downers Grove, Ill.

The disparity between the qualifications demanded or implied and the salary offered is responsible for *Chem. & Met.'s.* editorial. Skilled organic research chemists at $150 a month seemed ridiculous. EDITOR.

Review of Recent Patents

Activated Carbon

Modification of System for Recovering Soda From Black Liquor Produces a Highly Active Carbon Residue

Maynard J. Creighton, of Wilmington, Del., has noted that the residue from leaching black ash in the soda pulp industry contains carbon of an active type, although much less active than some of the commercial carbons and consequently discarded. By modifying the recovery process it is possible to produce a highly active carbon and at the same time obtain a better quality of recovered soda.

Black liquor is evaporated and incinerated as usual, except that it is not necessary to push the incineration beyond the point where good fuel value is secured. The material is then heated to about 600 deg. C. and steam is passed through for 20 to 60 minutes. Upon leaching the residue, a colorless solution of sodium carbonate is obtained, containing substantially no organic or empyreumatic matter. The percentage recovery of soda is very good, there being little loss in the low-temperature incineration or in the reheating.

The carbon is separated in a filter press, washed, neutralized with acid, washed again and dried. It seldom needs regrinding to produce a material of extreme fineness. (1,483,160; Feb. 12, 1924; assigned to Darco Corporation.)

Polymerizing Fatty Acids

Decomposition Avoided by Heating Fatty Acid Soap Under Pressure in Presence of Alkali

Jacob Lund and Hermann Hausamann, of Fredrikstad, Norway, have pointed out that in polymerizing the glycerides of unsaturated fatty acids by prolonged heating at 280 to 310 deg. C. there is considerable loss through decomposition. They have suggested a different method for obtaining the polymerization.

The glycerides are first saponified with alkali, refined with concentrated caustic soda lye and separated by addition of salt. The resulting soap is heated in the presence of alkali in a closed vessel to a temperature between 200 and 215 deg. C. During this heating polymerization takes place with practically no loss. The light-colored soap product may be used directly, or the fatty acids may be separated from it.

The process described may be applied with advantage to the fatty byproducts of the refining process, such products, commonly called soap-stock, being dark colored and containing alkali. On being subjected to the treatment described above they are converted into light-colored products having a pleasant odor. (1,481,845; Jan. 29, 1924; assigned to De Norske Fabriker.)

American Patents Issued April 1, 1924

The following numbers have been selected from the latest available issue of the *Official Gazette* of the United States patent Office because they appear to have pertinent interest for *Chem. & Met.* readers. They will be studied later by *Chem. & Met.'s* staff, and those which in our judgment, are most worthy will be published in abstract. It is recognized that we cannot always anticipate our readers' interests, and accordingly this advance list is published for the benefit of those who may not care to await our judgment and synopsis.

1,488,474—Machine for Molding Insulators. James A. Burns, Pittsburgh, Pa., assignor to Westinghouse Electric & Manufacturing Co.

1,488,480—Regeneration of Alkaline Storage-Battery Elements. Thomas A. Edison, West Orange, N. J., assignor to Edison Storage Battery Co., West Orange.

1,488,481 — Regeneration of Storage-Battery Elements. Thomas A. Edison, West Orange, N. J., assignor to Edison Storage Battery Co.

1,488,504—Method of Making Insulating Material. John J. Keyes, Wilkinsburg, Pa., assignor to Westinghouse Electric & Manufacturing Co.

1,488,545—Suction Mold. August Kadow, Toledo, Ohio, assignor to Libbey Glass Manufacturing Co., Toledo.

1,488,553—Process of Coating Sheet Steel With Aluminum. Samuel Peacock, Wheeling, W. Va., assignor to Willis G. Waldo, Washington, D. C.

1,488,571 — Process of Preparing Ethylene Formochlorhydrin. Foord Von Bichowsky, San Francisco, Calif.

1,488,606 — Briquet and Process of Making the Same. George W. Love, Mohrland, Utah, assignor of one-half to C. G. Gibbons, Mohrland, Utah.

1,488,608—Liquid or Plastic Cellulose Composition. Howard W. Matheson, Montreal, Que., Canada, assignor to Shawinigan Laboratories, Ltd., Montreal.

1,488,622—Mounting for Fusion Kettles. Oliver S. Sleeper, Buffalo, N. Y., assignor to Buffalo Foundry & Machine Co., Buffalo.

1,488,649—Gas Regulator. James J. Scheurich, Joplin, Mo.

1,488,656—Chemical Heater. George Hugh Wallace, Port Jefferson, N. Y.

1,488,721—Storage-Battery Cell and the Like. John Waddell, Bakewell, England.

1,488,730—Process for the Manufacture of Nitrobenzoic Acids. Frank H. Beall, Baltimore, Md., and Donald Byal Bradner, Edgewood, Md.

1,488,738—Electric Battery. Thomas R. Cook, Pittsburgh, and Paul E. Norris, Wilkinsburg, Pa., assignors to Westinghouse Union Battery Co., Swissvale, Pa.

1,488,745—Separating Process. Ridsdale Ellis, Oak Park, Ill., assignor, by direct and mesne assignments, to Ellis Flotation Co., Inc., New York.

1,488,765 — Adhesive Material. William Joseph Owens, San Francisco, Calif.

1,488,787—Explosive and Process for Its Manufacture. Etienne Harle, Rouen, France.

1,488,798—Insulated Wall for Ovens and the Like. William F. Schaller, San Francisco, Calif.

1,488,805—Process of Treating Spent Clarifying and Decolorizing Agents. Marvin L. Chappell, Edward P. Wright, and Merle M. Moore, El Segundo, Calif., assignors to Standard Oil Co., San Francisco.

1,488,815—Vitamin Body and Method of Preparing the Same. Isaac F. Harris, Tuckahoe, N. Y.

1,488,826 — Waterproof Liquid Wax. Ezekiel Pander, San Francisco, Calif.

1,488,820—Process of Making Cooking Liquors. Joseph E. Plumstead, Wilmington, Del., assignor to Jessup & Moore Paper Co., Philadelphia, Pa.

1,488,830—Cooking Liquor. Joseph E. Plumstead, Wilmington, Del., assignor to Jessup & Moore Paper Co., Philadelphia.

1,488,844—Soporific. Walther Straub, Freiburg in the Brisgau, Germany, assignor to Farbenfabriken vorm. Friedr. Bayer & Co., Leverkusen, near Cologne-on-the-Rhine, Germany.

1,488,862 — Apparatus for Operating on Filtrable Materials. Charles D. Burchenal, New York, N. Y.

1,488,869—Gas Generation. Thomas Cureton, Dayton, Ohio, assignor to Gas Research Co., Dayton.

1,488,881 — Ink Remover. Frederick E. Jackson, Grosse Pointe, Mich.

1,488,908—Dry Cell. Harold de Olaneta, New Haven, Conn., assignor to Winchester Repeating Arms Co., New Haven.

1,488,910—Continuous Heating Method and Apparatus. Conrad Dressler, New York, N. Y., assignor to American Dressler Tunnel Kilns, Inc., New York.

1,488,914 — Method of Making Sheet Glass. Frederick Gelstharp, Tarentum, Pa., assignor to Pittsburgh Plate Glass Co.

Complete specifications of any United States patent may be obtained by remitting 10c. to the Commissioner of Patents, Washington, D. C.

Ammonia Oxidation

Ivar W. Cederberg, of Berlin-Steglitz, Germany, has developed an apparatus using porous plates as catalyst supports for the oxidation of ammonia.

The catalyst zone, which consists of a number of porous plates 1 (pumice stone with finely divided platinum precipitated on the surface), is located in a tubular chamber formed by pressing a number of metal rings 2 into close contact. The porous plates are so shaped as to fill the spaces left between the metal plates. With this construction it is difficult for gases to evade reaction by passing around the ends of the porous plates instead of through them. Gases which do bypass in this manner are confronted with the broad upper surface of the plates. The outer portions of the metal plates form a series of fins that serve to radiate the excess heat of reaction. For ammonia oxidation, these plates are made of aluminum or a suitable nickel alloy. (1,481,957; Jan. 29, 1924.)

Hygrometer

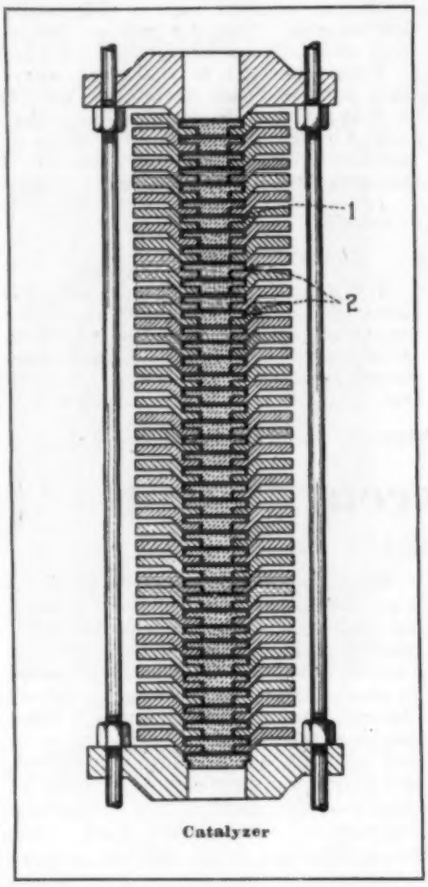
Albert Hermann, of the Forest Products Laboratory, Madison, Wis., and Carl A. Menzel, of Chicago, Ill., have found that the wick used in psychrometric or wet-bulb temperature indicators and recorders can be advantageously substituted by an alundum receptacle.

Experiments have shown that, using porous receptacles of alundum and an office fan to produce air movement, it is possible to reduce the temperature of the porous receptacle and the water in it accurately to the wet-bulb temperature of the surrounding atmosphere. A considerable excess of water dripping from the bottom of the porous receptacle does not interfere with the accuracy of the method. In the practical application of this invention the temperature-sensitive element of the thermometer or thermostat of whatever type is inserted in the porous receptacle, which is kept filled with water to a specified level in any convenient manner or is supplied, in certain types, with water under pressure. (1,484,129; Feb. 19, 1924; dedicated to the people of the United States.)

Mixing System for Paints

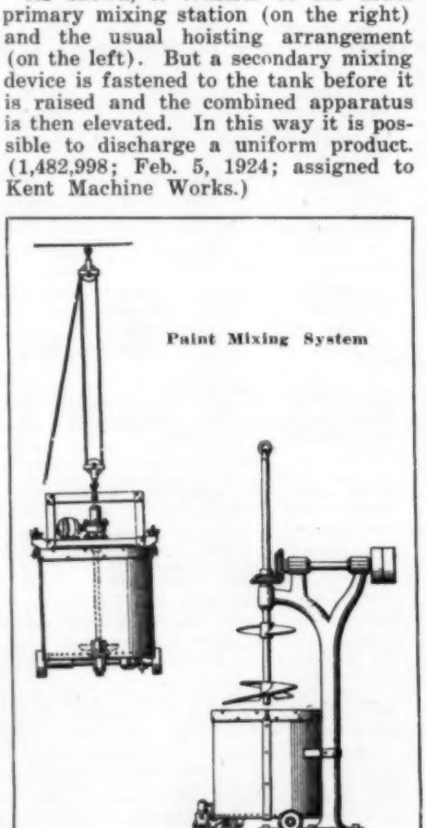
James W. Kent, of Brooklyn, N. Y., has suggested a mixing system which overcomes some of the difficulties usually encountered in mixing such materials as paint.

In the manufacture of ready-mixed paints it is desirable to have equipment so arranged that a single mixer will serve to agitate the contents of a number of tanks, the latter being mounted on castors so that they can be moved about as required. Immediately after removing from the mixer these tanks should be emptied and as they contain from 60 to 100 gal., it has been found most convenient to hoist the tanks and fill cans and other containers through draw-off cocks in the bottom of the tanks. Settling takes place when it is not possible to empty the tank immediately, and Mr. Kent's arrangement is designed particularly to avoid this.



Catalyzer

As shown, it consists of the usual primary mixing station (on the right) and the usual hoisting arrangement (on the left). But a secondary mixing device is fastened to the tank before it is raised and the combined apparatus is then elevated. In this way it is possible to discharge a uniform product. (1,482,998; Feb. 5, 1924; assigned to Kent Machine Works.)


Paint Mixing System

Important Articles in Current Literature

More than fifty industrial, technical or scientific periodicals and trade papers are reviewed regularly by the staff of *Chem. & Met.* The articles listed below have been selected from these publications because they represent the most conspicuous themes in contemporary literature, and consequently should be of considerable interest to our readers. A brief résumé of each article is included in the reference given. Since it is frequently impossible to prepare a satisfactory abstract of an article, this list will enable our readers to keep abreast of current literature and direct their reading to advantage.

"Formation of Acetone From Acetates." *Erik Hägglund.* The yield of acetone from sodium acetate is less than from calcium acetate. Contrary to expectation, addition of CaO or $Ca(OH)_2$ to the sodium salt does not decrease the yield by causticizing Na_2CO_3 and thus favoring the methane side reaction; there is even an increase of yield. The rate of distillation (in superheated steam) is greatly accelerated by addition of Na_2CO_3, CaO, $Ca(OH)_2$, $CaCO_3$ or calcium acetate. *Journal für praktische Chemie,* March, pp. 50-65.

"Storage and Shipping of Hydrochloric Acid." Wooden containers (fir or teakwood) about 3 in. thick, lined with a soft gray acid-proof rubber about 0.1 in. thick, have been found superior to steel lined with hard rubber. A new variety of pitch, stable to 40 per cent HCl at 100 deg. C., is being produced in Germany and Switzerland under the name of "prodorite." *Chemiker-Zeitung,* March 8, p. 123.

"The Phosphoric Acid Problem." *H. Niklas* and *K. Scharrer.* A discussion of the difficulties confronting German producers. Co-operative effort of scientific, technical and agricultural interests will be required to save the industry. *Chemiker-Zeitung,* March 8, pp. 121-2.

"A New Cleansing and Bleaching Agent." *P. Krais.* Sodium *p*-toluenesulphochloramide is a bleaching agent similar in effect to the hypochlorites, except that is does not weaken the fiber appreciably even at the boiling temperature. *Chemiker-Zeitung,* March 1, p. 111.

"Marketing of Potash." *Charles H. MacDowell.* How this important chemical and fertilizer is bought and sold. *Engineering & Mining Journal-Press,* April 5, 1924, pp. 557-8.

"Cutting Down Heat Losses by Proper Steam Line Insulation." *H. S. Bell.* An account of the large heat losses in petroleum refining and how they are avoided. (Second article.) *National Petroleum News,* April 2, 1924, pp. 93-8.

"Kinetics of Hydrogenation." *E. J. Lush.* A study of the mechanics of the process. *Journal of the Society of Chemical Industry,* March 14, pp. 53T-56T.

"Refinery Heat Losses and Insulation: Stills and Settings." *H. S. Bell.* The first of a series having to do with insulation as a means of increasing efficiency in heat utilization. *National Petroleum News,* March 26, pp. 62-4.

News of the Industry

Summary of the Week

New offer on Muscle Shoals, providing for American Nitrate Corporation, to be presented to Senate Committee on Agriculture.

Development of natural soda deposits in Oregon contingent upon rail extension.

Senator Ladd introduces bill to permit prospectors to take up claims on potash lands.

Imports of coal-tar dyes at New York amounted to 293,862 lb. in March.

Plans for Washington meeting of American Chemical Society completed.

Electrification of calcium arsenate dust to be studied by Bureau of Standards and Bureau of Entomology in co-operation.

Executive secretary of Federal Power Commission offers figures to show that total payment under Ford's Muscle Shoals offer falls short of that of Southern power companies.

Senate to Get New Offer on Muscle Shoals

It is understood that when the Senate Committee on Agriculture meets April 16 to hold its hearings on the disposal of Muscle Shoals, at least one entirely new offer will be presented for its consideration. J. H. Levering, engineer, of Los Angeles, is reputed to be responsible for the terms of the proposal, which will be laid before the committee by former Representative James T. Lloyd of Missouri. An advance copy of the offer shows that in many ways it is similar to the Morin bill, which was introduced in the last Congress.

Briefly, it provides for establishing an American Nitrate Corporation, capitalized at $10,000,000, of which $1,000,000 must be paid in before the government is to lease to it for 50 years all of the properties at Muscle Shoals. The corporation is to be governed by five directors, two of whom (known as the government directors) are to be selected by the Secretary of Agriculture. The government directors are to control the sale and distribution of the nitrates and fertilizers produced by the corporation.

The Secretary of Commerce, with the assistance of the director of the Bureau of Standards, is to solicit and pass on competitive bids for the construction and completion of the project. In preparing its own bid the corporation proposes to take advantage of the engineering experience available in other government agencies, including the Engineers Corps of the army, the U. S. Reclamation Service and the Federal Power Commission.

In addition to operating the existing nitrate plants and refitting them to make the desired fertilizer compounds (or explosives, should occasion arise), the plan calls for the maintenance of a research department in co-operation with the Agriculture and War Departments. The purpose of such a department is to develop processes for the fixation of atmospheric nitrogen.

Within 2 years from taking over the lease the corporation must have the hydro-electric plant ready to generate 100,000 hp., within 3 years the output must be 200,000 hp. and within 5 years 600,000. hp. After completion of the works the corporation is permitted to sell power in excess of its operating requirements, for which it is to pay the government one mill per horsepower-hour as part compensation for the lease. Provision is also made for the government to recapture the plant after 5 years if certain terms are met.

Potash Lands for Prospectors

With the idea of encouraging drilling operations in the search for potash deposits, Senator Ladd of North Dakota has introduced a bill that would permit prospectors to take up claims of 2,560 acres. If potash is found, the locators would be given a lease covering the land. The Searles Lake area is excluded from the provisions of the measure.

To Study Electrification of Calcium Arsenate

Dr. F. B. Silsbee has been designated by the Bureau of Standards to make a preliminary investigation of the phenomenon of electrification of calcium arsenate dust, in co-operation with the Tallulah laboratory of the Bureau of Entomology. Dr. Silsbee is now in Louisiana giving preliminary consideration to this subject to determine whether additional experimental work will be required at the Bureau of Standards. The work is being done in co-operation with Dr. B. R. Coad, of the Bureau of Entomology.

Engineer Again at the Head of the Reclamation Service

Conduct of the federal government's reclamation activities again is in the hands of an engineer. D. W. Davis, the business man chosen by Secretary Work as Commissioner of Reclamation, has been removed from that position and Dr. Elwood Mead has been selected as his successor. Many protests had been made against substituting a non-technical man for an engineer in this work.

Dr. Mead is professor of rural institutions in the University of California and was until recently chairman of the State Land Settlement Board. He has had lifelong experience in irrigation administration and since last December has been with the Advisory Committee on Reclamation engaged in reorganizing that service in the Interior Department.

Mr. Davis will continue with the bureau as head of the newly created division of finance, which will act as the bureau's collection and credit agency.

American Institute of Chemistry Elects Officers

The annual meeting of the American Institute of Chemists will be held at the Chemists' Club in Rumford Hall on April 28. The meeting will be preceded by a dinner in the dining room of the Chemists' Club at 6:30. At the annual election of officers of the Institute the following were elected: President, M. L. Crossley; vice-president, Lloyd Van Dorn; secretary, L. R. Seidell; treasurer, Clarence K. Simon; councilors for 3 years, H. G. Byers, H. B. Gordon and M. A. Hunter; councilors for 2 years, A. P. Sachs, William Walker and F. D. Crane; councilors for 1 year, Calm Hoke, W. Lee Tanner and Benjamin Harrow.

Ford Offer for Muscle Shoals Yields Less Return Than Power Companies'

Power Commission Secretary Estimates Difference of 85 Millions Over 100-Year Period—Also Cites Profit From Sale of Power

THE executive secretary of the Federal Power Commission, O. C. Merrill, is authority for a statement that under the Ford offer for Muscle Shoals the United States would receive during a 100-year period a total payment of $225,404,954, as compared with $310,399,400 from the tender of the associated Southern power companies. These figures, which include the $55,000 annual maintenance payment proposed under the Ford offer and an estimated maintenance and replacement liability of $150,000 under the "utilities" offer, were prepared by Mr. Merrill on March 3 at the request of Representative Harry E. Hull, but have not previously been made public.

The payments to the United States both including and excluding the maintenance charges were estimated by Mr. Merrill as follows:

Not Including Maintenance Payments

Ford Offer	
Maximum annual payment	$2,321,946
Total payments 50-yr. period	103,866,654
Total payments 100-yr. period	219,964,954
Utilities Offer	
Maximum annual payment	3,150,800
Total payments 50-yr. period	138,084,400
Total payments 100-yr. period	295,624,400

Maintenance and Renewals Spillway Gates

Ford Offer	
Maximum annual payment	55,000
Total payments 50-yr. period	2,690,000
Total payments 100-yr. period	5,440,000
Utilities Offer	
Estimated maximum annual liability	150,000
Estimated total liability 50-yr. period	7,275,000
Estimated total liability 100-yr. period	14,775,000

Including Maintenance Payment.

Ford Offer, including $55,000 annual maintenance payment	
Maximum annual payment	2,376,946
Total payment 50-yr. period	106,561,654
Total payment 100-yr. period	225,404,954
Utilities Offer, including estimated maintenance liability of $150,000 per annum	
Maximum annual payment	3,300,800
Total payment 50-yr. period	145,359,400
Total payment 100-yr. period	310,399,400

The payments to the government are also compared with the best estimates of the construction cost of the dams and power plants and their power output. In support of his estimate of 3.5 mills per kw.-hr. as sales value of the power, Mr. Merrill submits a letter from Hugh L. Cooper, well-known hydro-electric engineer, in which it is stated that "a lessee would be very fortunate if the net cost to him of the power he received was 3.75 mills per kw.-hr. for primary power and 1.87 mills per kw.-hr. for secondary power."

Estimated Cost of Dams and Power Houses	
Dam No. 2, 620,000 hp	$50,800,000
Dam No. 3, 250,000 hp	27,330,000
870,000 hp	78,130,000
Interest Liabilities of United States at 4 per Cent	
Maximum annual	3,125,200
For 50-yr. period	142,980,000
For 100-yr. period	289,240,400
Power Available	
In average year with 80,000-hp. steam plant used as reserve, kw-hr	2,000,000,000
Equivalent to continuous output of, hp	306,000
Annual Sale Value of Power	
At 3.5 mills at switchboard	$7,000,000

In his letter to the Power Commission secretary, Mr. Cooper made the following statement as regards the sales value of the power:

"Assuming that a lessee was to use the above power for a period of 50 years, I am of the opinion that a lessee would be very fortunate if the net cost to him of the power he received was 3.75 mills per kw.-hr. for primary power and 1.87 mills per kw.-hr. for secondary power of the character of power that will be produced at dams Nos. 2 and 3

"Considering future certain rises in the cost of steam power during a 50-year period and no change in that period of the above lease prices, the values above specified are believed to be abnormally low. They can be used very profitably now. As steam power costs rise the proposed lease prices become increasingly favorable."

Natural Soda Deposit in Oregon May Be Developed

Announcement has been made that the General Petroleum Co. of California and the Spreckels interest of San Francisco plan to expend $300,000 on a plant to produce sal soda at Alkali Lake, Ore., provided 135 miles of railroad is built. The Oregon Public Service Commission has made application, and a hearing took place recently at Portland before the Interstate Commerce Commission.

The petitioners aver that a survey has demonstrated that between 500,000 and 800,000 tons is available, from 97 to 98 per cent pure. The deposit was examined by Hoyt S. Gale, of the U. S. Geological Survey, in 1915, and an official report states that the alkali exists as a crust on the surface of mud in and about shallow saline ponds. In potholes around the margin of the deposit an almost pure soda has crystallized, which has been extracted in a small way from time to time.

The representatives of the Californian interests maintained at the hearing that the building of a railroad into this region will open up a district of considerable commercial possibilities.

Imports of Dyes Increase in March

The imports of coal-tar dyes for March, 1924, through the port of New York totaled 293,862 lb., with an invoice value of $302,016. In addition to the above imports of dyes reported from the port of Boston totaled 8,937 lb., with an invoice value of $5,231. The average monthly import of dyes according to the preliminary figures for the port of New York during 1923 was about 220,000 lb. The average monthly import of coal-tar dyes into the United States during the year 1922 was 331,000 lb.

Imports Through New York

	Lb.	Value
January	228,743	$232,571
February	158,874	176,657
March	293,862	302,016

The five leading dyes by quantity imported in March were: Fast Green, 16,720 lb.; Algol Blue 3G, 15,139 lb.; Indanthrene Golden Orange G, 13,195 lb.; Indanthrene Golden Orange R, 12,696 lb.; Indanthrene Blue GCD, 9,666 lb.

Suggestion Committees Effective at General Electric

An index of the effectiveness of the system that rewards workers for suggestions is found in the recent compilation made by suggestion committees operating in plants of the General Electric Co. Of the 8,078 suggestions reviewed by the various committees in the works, 1,752 were accepted. Awards ranging from $1 to $500 were paid to those whose suggestions were accepted, making a total of $22,988 paid out in cash awards during 1923.

Briefly, the operation of the suggestion communities is as follows: Suggestions for improvements are focused through a small committee in each works. This committee investigates the suggestion, passes upon the merit of it, and makes the award to the man or woman who made the suggestion, or explains why the suggestion cannot be effectively adopted. In most cases the award can be made within a period of a few weeks after the suggestion is received; where it is necessary to put the suggestion into practice in order to determine its value, a longer time must elapse. The suggestions have a wide range, from additional protective devices to new methods of working materials, and include new methods of following production, as well as improvements in plant publications.

Data on Fossil Gums

The extensive use of fossil gums and the dearth of published information regarding the origin of the deposits and methods of development have led to the accumulation by the Interior Department of data on the subject through correspondence and conferences. The information is now being compiled at the Non-Metallics Mineral Experiment Station of the Bureau of Mines, New Brunswick, N. J.

Butesin Picrate, a New Remedy for Burns

Floyd K. Thayer, research chemist, Abbott Laboratories, Chicago, has developed a new compound, butesin picrate, for treating burns. Tests conducted at the laboratory and chemically as well have shown that the product possesses a remarkable anesthetic power at low concentrations and at the same time a marked bactericidal action.

Surgeons of a large steel works, near Chicago, after treating hundreds of burn cases with butesin picrate, characterized the results obtained in all degrees of burns as "very wonderful." This new treatment has been found as efficacious on electric burns as on steam and hot metal burns. So strongly analgesic is the action that all the burning sensation disappears within 15 to 30 minutes.

Washington News

Would Call for New Bids on Muscle Shoals

Representative Frothingham of Massachusetts, one of those on the House Military Affairs Committee that opposed Ford's Muscle Shoals proposition, made a public statement last week expressing the view that the acceptance of the Ford offer would seriously penalize the textile industry of New England. This would result, he contended, from the Detroit manufacturer's use of cheap power to establish large cotton mills that would eventually displace those in all other textile centers of the country.

"There is only one sensible thing to be done about Muscle Shoals," Mr. Frothingham's statement concludes; "there ought to be general legislation passed by Congress authorizing and directing the Secretary of War, or the Federal Power Commission, to safeguard the rights of all of the people of the United States by advertising for new bids under certain specifications common to all comers for the manufacture of fertilizer ingredients, for the maintenance of the nitrate plants in stand-by condition to make explosives in time of war, and for the sale and distribution of the surplus power to all who desire to use this cheap hydro-electric energy under the regulations of the federal water-power act with penalty clauses attached for non-performance of contract. This proposed great grant of the people's money and natural resources to Henry Ford, one of the richest men in the world, without regulation and without penalty for non-performance, should not be made. Public opinion will not support it, and it if is done a great scandal will ensue."

Favorable Report Predicted for Opium Bill

A favorable report by the Ways and Means Committee on the bill of Representative S. G. Porter of Pennsylvania to prohibit the importation of crude opium for the purpose of manufacturing heroin is expected at an early date.

Full hearings on the bill have been held by the committee. The unanimous testimony of the witnesses who appeared in person before the committee was in favor of the measure. Several letters dissenting from the bill on the ground that heroin has an important place in medical science were presented, most of the opposition coming from physicians in Pennsylvania, where the proposal has been rather fully discussed.

General Rupert Blue, former chief of the Public Health Service, told the committee that the Public Health Service and the medical corps of the army and navy have abandoned the use of heroin because of its insidious results and that the stocks have been disposed of or destroyed. Heroin is not an essential to the medical profession in relieving pain, General Blue said, as there are substitutes that have the same beneficial effect and that are much less dangerous in results upon the patient.

Dr. J. J. Richardson, representing the American Medical Association, placed the strength of that organization back of the bill.

Representative Porter asserted that there are at least half a million addicts of the heroin habit in the United States and that this number is growing. The drug is one of the most powerful and one of the most destructive of physical and mental health of any opiate and as there are less injurious drugs to supplant it in medical use, it should be outlawed, he declared.

Freight Ruling Extends Use of Multiple Unit Tank Cars

More extended use of multiple unit tank cars is expected to follow the ruling of the Interstate Commerce Commission that commodities in such containers are entitled to the same freight rates in regular tank cars. In addition to the reduction in transportation hazards, when chemicals are transported in multiple unit tanks, there is the additional advantage that it makes for flexibility in distribution.

There is no disposition on the part of the industry to contend that the preferential classification should be extended to multiple unit cars if the units are removable. The position of the Interstate Commerce Commission is very clear that the low rate should apply only when the compartments are made a permanent part of the car.

Dry-Cell Conference Called

A conference on dry-cell standardization and testing will be held at the Bureau of Standards, Washington, Monday and Tuesday, April 28 and 29. This conference will reconsider the standard sizes of dry cells adopted by the government in conference with the industry several years ago and determine the extent to which the customary standards should be modified or supplemented. Particular importance attaches to the new types of dry cells required for radio service.

The performance and testing specifications for dry cells will also be considered. It is expected that specifications for testing and requirements of performance of radio dry cells will be given particular attention. Manufacture of this type of cell has grown within the last few years so that at the present time the industry is producing many million dry-cell batteries every month.

Modern Tannery Established in Canary Islands

Consul William P. George in a report from Teneriffe states that a new tannery, equipped with up-to-date, modern machinery, has recently been placed in operation in Santa Cruz, Teneriffe, Canary Islands. The estimated production of the plant will be 200 hides and 300 skins per week. The hides will be used for sole leather, and the skins, mainly of goat, sheep and calf, for upper leather. All these hides can be obtained locally, and the production of this tannery, which is the first to be established in this province, will for the time being be entirely consumed locally.

German Fertilizer Materials on Reparation Account

Advices to the Department of Commerce say that the agreement between the "Badische Anilin und Soda Fabrik" at Ludwigshafen, and the "Hoechster Farbwerke" at Hoechst-am-Main, entered into for 3 months from Nov. 24, was renewed on Feb. 19, to last until May 24, 1924. The present agreement retains conditions of the older agreement in so far as they are not contrary to any new current terms set down.

The Badische is pledged to furnish on reparations account and for consumption by Belgium, France and Italy, 3,600 tons of nitrogen during March, April and May. The distribution is as follows:

	Belgium, Tons	France, Tons	Italy, Tons	Total Tons
Ammonium sulphate	450	1,530	960	2,940
Nitrate of soda	150	108	120	378
Ammonium nitrate	0	0	120	120
Ammonium chloride	0	108	0	108
Urea (synthetic)	0	54	0	54
Total	600	1,800	1,200	3,600

Deliveries are to be made monthly, and in conformity with the following table; they must be made without fail by May 31, 1924.

		March	April	May
Ammonium sulphate	Belgium	400	50	0
	France	900	510	120
	Italy	430	290	240
Nitrate of soda	Belgium	0	100	50
	France	10	40	58
	Italy	55	35	30
Ammonium nitrate	Italy	55	35	30
Ammonium chloride	France	60	36	12
Urea	France	30	14	10

These deliveries shall not be paid for by Allied authorities; they will be charged to the credit of Germany's reparations account.

Allied authorities will retain the right to examine and pass upon questions concerning personnel of the factories, with a view of facilitating production and keeping the plants in running order.

The export tax on ammonium sulphate, ammonium chloride, sodium nitrate, potassium nitrate, ammonium nitrate, double nitrate salts of ammonium and potassium, double sulphate and nitrate salts of ammonium, synthetic urea, as well as other nitrates, to unoccupied territory, is fixed at 1 per cent.

Czechoslovakia Establishes Tanning School

According to information received by the hide and leather division of the Department of Commerce, the Minister of Education in Czechoslovakia, after consultations with the trade organizations, has approved the establishment of a tanning trade school in Konigratz. The state has agreed to supply equipment to the value of 2½ million kronen. The school is to be fitted with the most modern equipment available.

News in Brief

Pulpwood Imports From Canada Increasing—Exports of pulpwood from Canada to the United States are again increasing, those for February being 131,785 cords, as compared with 79,504 cords in January.

New Type of Gas Holder to Be Tried—The Northern Indiana Gas & Electric Co., Michigan City, Ind., has arranged for the construction of a new type of artificial gas holder on local site, said to be the first of this kind ever built in America. The new unit has no outer frame, being formed of riveted steel plates, about 32 in. wide and 20 ft. long, effecting a solid steel shell. It will be 105 ft. in diameter and 160 ft. high, with storage capacity of 1,000,000 cu.ft. Instead of sliding up and down in a steel frame, as with the regular types of holders, the new unit is stationary, with a steel piston inside of the shell, raising and lowering as the amount of confined gas varies. The holder is known as the "Waterless" type, no water being used to seal the unit as customary in other designs, and will represent an investment of about $150,000. It is the invention of Conrad Jagschitz, connected with Maschinenfabrik, Augsburg-Nurnberg, Germany, and now in this country to supervise the construction, which will be carried out by the Bartlett-Haywood Co., Baltimore, Md. It is said that the new type of gas holder was introduced first in Germany in 1915, and that since this time a total of forty-six have been constructed in different parts of that country, France and Holland, showing marked efficiency and economy in service.

Carbon Black Company Organized in Alberta—A company is being formed in Alberta under the name of Prairie Oils, Ltd., to manufacture carbon black from natural gas. Those associated with this company are: Charles Miller, who is president; E. W. Backus, the pulp and paper manufacturer, vice-president; B. D. McCaul, secretary, and T. W. Horne, treasurer. It is conceded that the natural gas at High Prairie, Alta., could not find a commercial market, and accordingly the dominion government has issued the necessary permit, although it has refused permits in the Province of Ontario on the ground that the natural gas has greater value for illuminating and heating purposes than for the manufacture of carbon black. The new company has a capital of $200,000.

Synthetic Ammonia Developments in Spain—A Reuters dispatch from Madrid states that as a result of experiments in the manufacture of synthetic ammonia which have been carried out for some time past, the question is being considered of forming an industrial company with a large capital to undertake the manufacture of synthetic ammonia on a large scale.

Alcohol Explosion Causes $250,000 Fire—Fire, April 4 destroyed the chemical department of the plant of the Pennsylvania Rubber Supply Co., Prospect Ave. and E. 28th St., Cleveland, Ohio, with a loss of $250,000. The blaze started with an explosion of alcohol tanks.

Developments Awaited in Chicoutimi Pulp Industry—In the pulp and paper industry of Canada eyes are turned toward the Chicoutimi and Lake St. John district of the Province of Quebec where before the end of April developments of great magnitude are forecast as a result of the liquidation of the Chicoutimi Pulp Co. Both Lord Rothermere, who is now in Canada, and Sir William Price are known to be following closely the recent developments in the Chicoutimi pulp group.

West Virginia Chlorinating Plants Using Orthotoluidine Test — About seventy chlorinating plants in West Virginia are using orthotoluidine-testing outfits furnished through the agency of the State Health Department. The variation in the chlorine consuming content of the water due to bacteria and organic matter finding its way into surface streams has been found to be considerable. To overcome this and to make certain that the water has been thoroughly disinfected a small kit has been devised by the department and sent to operators of chlorinators at cost price. Six Nessler tubes are used as standards and have different tints of green corresponding to 0.03, 0.05, 0.08, 0.1, 0.2, 0.3 part per million excess chlorine. One other Nessler tube contains the orthotoluidine solution while another is used for making the test. One cubic centimeter of orthotoluidine is introduced into the water which has been chlorinated and after mixing is compared with the standards. Ordinarily the department advises holding the excess chlorine between the standards 0.1 and 0.2, and it has been found that no appreciable odors and tastes are caused in the supply unless creosote or phenol compounds are present in the river water.

Expert Appointed to Aid Match Industry of India

Harold Shantz, vice-consul at Calcutta, in a report on the match industry of India says that notwithstanding the import duty on matches, amounting to over 100 per cent ad valorem, in most cases the establishment of match factories in that country has not thus far been successful. A large number of small concerns from time to time have been started, but many of these have failed because their owners did not have sufficient technical knowledge to carry out the projects successfully. The government of Bihar and Orissa has appointed an expert who will inspect existing match factories in the province and give advice to their owners. He will also test the various woods available in local forests and advise as to the most likely site for factories.

Company Reports

R. H. Adams, president of the American Linseed Co., in his annual report said the first 3 months of 1924 show substantial profits. The Chicago branch, which for ten months was closed because of fire, is now in operation, also the Staten Island plant, closed for the same reason during last summer and fall. The new product, Gold Medal Mayonnaise, introduced in 1923, at an expense charge against income of more than $400,000, is now being marketed on a profitable basis. The construction of a Nucoa plant at San Francisco has just been finished. This should effect considerable saving and make the old plant available for manufacture of mayonnaise.

Trade Notes

Charles Francesconi has gone to San Francisco to take charge of the Western office of J. C. Francesconi & Co.

A cable from Consul-General A. W. Weddell, Calcutta, dater March 28, stated that the exports of shellac from Calcutta for February amounted to 31,674 cwt., 62 per cent of which was destined for the United States.

Approval of a comprehensive revision of the rates on rosin and turpentine and other commodities known as naval stores from Southeastern and Mississippi Valley producing points to various destination territories, as proposed by Southeastern lines, has been refused by the Interstate Commerce Commission.

Vice-Consul C. M. Corafa at Athens reports that olive oil production for Greece in 1923 is officially reported as 14,261,163 gal. This figure does not include the districts of Achaia-Elis, Samos, Pelli, Seres, Trikkala, Florina and Chios, which will bring the total production up to about 16,925,000 gal.

The Cushnoc Paper Co. and the Kennebec Paper Co., both of Augusta, Me., and now in bankruptcy, are perfecting plans for a merger of interests and properties. It is purposed to reorganize both companies as a new company unit and it is held that this can be done for economical and successful production. The consolidation includes mill improvements.

Exports of rubber from Para and Manaos, Brazil, and Iquitos, Peru, for February, 1924, were 2,239 long tons, according to reports to the Department of Commerce, an increase of 863 long tons over total exports of 1,376 long tons in February, 1923. Of this amount, 1,208 long tons was shipped to the United States and 1,031 to Europe.

Drawback allowances recently granted include powdered casein, glue and paste manufactured by the Casein Manufacturing Co. of New York with the use of imported granulated casein; linseed oil, oil cake and oilmeal produced by the Fidelity Products Co. of Houston with the use of imported flaxseed, and on sulphate of alumina produced by the Merrimac Chemical Co. of Boston with the use of imported bauxite ore.

Scientific Washington Ready to Welcome American Chemical Society

Addresses by Millikan, Lewis and Slosson Feature General Programs — Unusual Opportunities to Inspect Government Bureaus and Edgewood Arsenal

DURING the week of April 21 Washington and her chemists will be hosts to the American Chemical Society. The final program for the convention bears witness to the fact that no pains have been spared to make the week both profitable and enjoyable for the visiting chemists. Professional interest in the latest developments in scientific and technical research will be cared for by the meetings of seventeen divisions and sections, with more than 400 papers scheduled. Social features have not been neglected and there will be ample opportunity to visit the scientific attractions of Washington as well as the places of general interest.

A summary of the week's scheduled activities follows:

Monday, April 21

Registration bureau will open at 10 a.m. in the New Willard Hotel, 14th St. and Pennsylvania Ave.

Council will meet at 2:30 p.m. in the Willard Room, New Willard Hotel, continuing the meeting at 8 p.m.

Tuesday, April 22

At 10 a.m. in the Ball Room of the New Willard Hotel, the convention will be welcomed by R. S. McBride, president of the Washington Section of the society, who will then surrender the chair to Leo H. Baekeland, president of the society. The general addresses that have been arranged are:

Robert A. Millikan, professor of physics, California Institute of Technology, "The Atom as Seen by the Physicist."

Gilbert N. Lewis, professor of chemistry, University of California, "The Atom as Seen by the Chemist."

In the afternoon, four of the divisions will hold special general programs. Industrial and Engineering Chemistry will begin its Heat Transfer Symposium; Organic Chemistry will discuss the mechanism of organic reactions; Physical and Inorganic Chemistry, photochemistry; Chemistry of Medicinal Products, vitamins, insulin, pituitary glands and organic mercurials.

These meetings will be followed by tea at the residence of Dr. Atherton Seidell.

Wednesday, April 23

Divisional and sectional meetings will begin at 9:30 a.m. at the Central High School, 13th and Clifton Sts.

Government laboratories will be inspected in the afternoon, leaving the Central High School at 1:30 p.m.

Dr. Edwin E. Slosson will be the speaker at an evening meeting, followed by a social evening in the ballrooms of the New Willard. Dr. Slosson has chosen as his topic "The Expansion of Chemistry."

Thursday, April 24

Divisional and sectional meetings will occupy the morning, with an excursion to Mount Vernon at 2:30 p.m. and a program of technical and popular motion picture films in the evening.

Friday, April 25

Divisional meetings will continue until completed, followed by visits to government laboratories.

A subscription dinner and dance at the Wardman Park Hotel, 7 p.m., takes the place of the usual banquet.

Saturday, April 26

An all-day excursion has been planned to Edgewood Arsenal, leaving Washington at 8:50 a.m. on special train. Various plants at the arsenal will be visited in the forenoon, and after luncheon on the grounds, there will be a field demonstration of chemical warfare service and equipment.

Production of Lithopone in Germany Declines

A detailed report on the lithopone trade of Germany has been made by W. T. Daugherty, assistant trade commissioner at Berlin. The report states that Germany not only is self-contained in lithopone production but has been a relatively heavy exporter before as well as after the war. This position is confirmed by official foreign trade figures, which show that Germany had a net export of 13,443 tons of lithopone in 1913, 9,270 tons in 1920, 5,691 tons in 1921, 11,037 tons in 1922 and 7,447 tons in 1923.

The United States is Germany's chief customer for lithopone, purchasing 3,244 tons in 1922 and 1,635 tons in 1923. Great Britain is the second best customer for lithopone, while before the war it was the foremost. In 1913 Great Britain purchased 5,374 tons out of a total German export of 17,532 tons. In 1922 Great Britain's purchases from Germany declined to 2,110 tons and in 1923 to 1,232 tons.

There are no figures available on Germany's lithopone production. A very rough unofficial estimate places production in 1913 at about 35,000 tons, or twice the amount exported. Present annual production is likewise estimated at around 15,000 tons. The falling off of production is of course traceable to the economic dislocation as a result of the war. In 1923 production doubtless dropped a great deal more on account of the Ruhr occupation. As in other industries, a revival of production may be looked for in lithopone production in 1924; the present industrial revival began roughly when the "Micum agreement" was signed on Nov. 23 last, pledging Germany to deliver reparations coal and to pay defaulted coal taxes.

There is no special evidence to support the belief that Germany has abandoned the use of byproduct zinc in the manufacture of lithopone, nor is it conceivable that a substitute has been found in practice for the necessary proportion of zinc sulphide in lithopone. Mention has been made of the loss of zincblende deposits with the partition of upper Silesia. It has been observed, however, that Germany is importing raw zinc in relatively large quantities from Polish smelters.

Polish Production of Potash and Superphosphates

A report to the Department of Commerce states that there are in Poland at present sixteen superphosphate factories, of which twelve are active. These twelve employ about 3,000 workmen. Two more factories are being built. According to data from six concerns, disregarding two active in Danzig, two in upper Silesia and two in Galicia, during the summer there was produced 50,000 tons of 16 per cent superphosphates, which, together with the remainder unsold after the spring season, amounts to 67,000 tons. During this period there were sold about 41,000 tons and there remained as a surplus for the autumn season 26,000 tons.

In 1923 Poland produced 363,307 tons of salt, as compared with 295,000 in 1922, and 61,494 tons of potash salts, as against 46,082 in 1922.

U. S. Is Large Buyer of Spanish Oxide of Iron

Exports of red oxide of iron from Malaga in January were about equal to exports of this product in December, according to a report from Vice-Consul H. L. Smith at Malaga. It is reported that the tendency for lower prices continued owing to the increased competition. During the past few months several new firms have been formed to export red oxide of iron and more and more brokers are endeavoring to handle this commodity. Shipments of low-grade red oxide of iron at low prices have tended to demoralize the market here. The principal demand during the month came from the United States. There was a revival of interest on the part of Great Britain and it is thought that a better demand for red oxide of iron from this source will soon be noticed in the Malaga market.

Lack of Materials Handicaps Japanese Chemical Industry

Japan's ambition to become the chemical manufacturer for the Far East apparently is not being realized, reports to Washington indicate. Her enthusiasm along that line seems to be on the wane. Certain of the Japanese chemical activities are prospering—particularly the makers of sulphur colors—but no progress is being made toward the upbuilding of the general chemical industry.

It is not a case of the industry being stifled by outside competition, although that prospect may have some bearing on the situation. The factor in the situation that has militated most against the growth of the chemical industry is the lack of raw materials.

Men You Should Know About

Dr. FRANK D. ADAMS, vice-principal of McGill University, dean of the faculty of graduate studies and of the faculty of applied science, has tendered his resignation and will leave McGill at the end of the present session after completing a service that extends over a period of 35 years.

FREDERICK E. BREITHUT, trade commissioner of the United States Department of Commerce, who served as a Major in the Chemical Warfare Service during the war, was married March 20, in Paris, to Mrs. Florence Hastings Norris. The bride is a daughter of General Hastings, one of the pioneer railroad builders of America. Mr. and Mrs. Breithut are now on an extended honeymoon and business trip through Switzerland, Austria and Czechoslovakia.

M. P. FREDERICK of Gallitzin, Pa., has been appointed chief of the new bureau of industrial relations of the Pennsylvania State Department of Labor and Industry.

JAMES J. GODFREY, president of the Kay Copper Co. and the Mother Lode Copper Mines Co., New York, has returned from an inspection trip of the properties of the companies in Arizona.

Prof. KOTARO HONDA, a metallurgist of note of Japan, recently spent two days in Cleveland as the guest of the Cleveland Section of the American Society for Steel Treating. Dr. Honda is professor of physics and metallurgy in the iron and steel research institute of the Imperial University, Sendai, Japan, and is on his way to attend the spring meeting of the Iron and Steel Institute of England. He spoke before the Cleveland chapter of the A.S.S.T. and also visited the Case School of Applied Science and different plants in the vicinity of Cleveland.

H. K. LOGAN, of the Bureau of Standards, is in California in connection with the examination of test pieces of iron and various alloys that were buried a few years ago and from which data are being obtained to determine the relative corrodibility of soils in various parts of the United States. Mr. Logan on March 14 addressed the members of the Southern California Section of the American Chemical Society on "The Corrosion of Pipes and Underground Structures."

W. G. MATHER and GEORGE BARTOL have been re-elected chairman of the board of directors and president, respectively, of the Otis Steel Co., Cleveland, Ohio.

Prof. LYMAN C. NEWELL, head of the department of chemistry in Boston University, delivered an address on "The Earlier and Later Days of Chemistry in New England" at the twenty-fifth anniversary meeting of the New England Association of Chemistry Teachers, held March 15 in Malden, Mass., where the organization was founded. The address was illustrated with lantern slides, portraits and autograph letters from Dr. Newell's collection. In recognition of his services to the association Dr. Newell was presented with a copy of resolutions adopted at this meeting. The resolutions acknowledge the work Dr. Newell has done for the society and expressed the thanks of the organization for his unbroken services. He was its first president and now holds the office of curator of the library and museum.

JAMES R. OWENS, formerly chief of the experimental plants department and later assistant to the technical director at Edgewood Arsenal, Edgewood, Md., is now in the chemical department of E. I. du Pont de Nemours & Co. For the present he is located at the Philadelphia works.

GILBERT RIGG, formerly with the New Jersey Zinc Co., is one of the joint recipients of the gold medal of the Institution of Mining and Metallurgy (London). The award was made conjointly to him and H. E. Gepp in recognition of their services to the science and practice of metallurgy, with special reference to the treatment of zinc ores and the development of electrolytic zinc in Australia.

Calendar

AMERICAN CHEMICAL SOCIETY, annual meeting. Washington, April 21 to 25.

AMERICAN ELECTROCHEMICAL SOCIETY, Hotel Bellevue-Stratford, Philadelphia, April 24 to 26.

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, Denver, Colo., July 15 to 18.

AMERICAN LEATHER CHEMISTS ASSOCIATION, Spring Lake, N. J., June 18 to 20.

AMERICAN OIL CHEMISTS SOCIETY, New Orleans, La., May 5 and 6.

AMERICAN PAPER AND PULP MILL SUPERINTENDENTS ASSOCIATION, Dayton, May 22 to 24.

AMERICAN PHYSICAL SOCIETY, Washington, April 25 to 26.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS, Cleveland, Ohio, May 26 to 29.

AMERICAN SOCIETY FOR STEEL TREATING, Moline, Ill., May 22 to 23.

AMERICAN SOCIETY FOR TESTING MATERIALS, Atlantic City, June 23 to 28.

AMERICAN WELDING SOCIETY, Engineering Societies Bldg., New York, April 22 to 24.

CANADIAN INSTITUTE OF CHEMISTS, Queens University, Kingston, Ont., May 27 to 29.

NATIONAL ASSOCIATION OF PURCHASING AGENTS, Boston, May 19 to 24.

NATIONAL FIRE PROTECTION ASSOCIATION, annual meeting, Atlantic City, N. J., May 13 to 15.

NATIONAL LIME ASSOCIATION, White Sulphur Springs, W. Va., May 20 to 23.

TAYLOR SOCIETY, Cambridge, Mass., April 24 to 26.

WORLD POWER CONFERENCE, London, June 30 to July 12.

SOCIETY OF INDUSTRIAL ENGINEERS, Buffalo, April 30 to May 2.

SOCIETY FOR PROMOTION OF ENGINEERING EDUCATION, Boulder, Colo., June 25 to 26.

DON VAN BUREN has been elected secretary and treasurer of the Duratex Corporation, Newark, N. J., manufacturer of artificial leather, etc. This office heretofore has been held by R. S. ALLEN, who will continue as president and general manager of the organization.

LEONARD A. YERKES has been elected a member of the board of directors of E. I. du Pont de Nemours & Co., Inc., to fill the vacancy caused by the death of J. A. Haskell. Mr. Yerkes is the president of the du Pont Fibersilk Co. and president of the du Pont Cellophane Co., both subsidiaries of the du Pont company.

At the ninth annual convention of the American Association of Petroleum Geologists, held March 26 to 28, JAMES H. GARDNER, president of the Gardner Petroleum Co., of Tulsa, Okla., was elected president; EARLE K. GAYLORD, chief geologist of the Pacific Oil Co., was elected vice-president, and E. C. DECKER, of Norman, Okla., was re-elected secretary and treasurer.

At a recent meeting of the Ohio Section of the American Institute of Mining and Metallurgical Engineers Prof. HERBERT M. BOYLSTON, of the Case School of Applied Science, Cleveland, Ohio, was elected chairman; L. B. MILLER and H. A. SCHWARTZ vice-chairmen, and C. B. MURRAY secretary and treasurer. WILLIAM KELLY, of Vulcan, Mich., newly elected national president of the Institute, was the guest of honor at a dinner given by the local section at the Hotel Winton, Cleveland, on March 31.

The Canadian Institute of Mining and Metallurgy has elected the following officers for this year: President, Dr. R. C. WALLACE, professor of geology in the University of Manitoba; vice-presidents, C. M. ODELL, Sydney, N. S..; N. R. FISHER, Thetford Mines, Que.; G. C. BATEMAN, Cobalt, Ont.; A. A. MILLER, Taylorton, Sask.; WILLIAM ELLIS, Three Hills, Alta., and THOMAS GRAHAM, Cumberland, B. C.

Obituary

J. L. MOORE, president of the Moore Steam Turbine Corporation, Wellsville, N. Y., died suddenly on April 2, after an illness of a few days. The end came as a severe shock because of the fact that Mr. Moore had been attending to business and in the best of spirits practically up to the time of his death. Mr. Moore is survived by his wife and one daughter, Helen. Mr. Moore went to Wellsville about 20 years ago as general manager and chief engineer of the Kerr Steam Turbine Co. Between 7 and 8 years ago he incorporated his own company and built his own plant. This company from its inception made splendid progress. Mr. Moore leaves the memory of one who was gentle and kind, ever truthful, and who loved and was loved by his fellowmen. His friends mourn the loss of a man of such splendid character.

Market Conditions

Spot Holdings of Arsenic Are Sold at Concessions

Trading in Chemicals Continues Along Moderate Lines—Prices Show Easy Tendency

GENERAL conditions in the market for chemicals have not changed much in recent weeks. Manufacturing industries are not operating actively enough to take up the supply. With offerings free, the advantage is with the buyer and reports of price shading and other concessions are typical of existing conditions.

The weighted index number for the week was slightly higher but this was largely due to a firmer market for some of the allied products and not to any stiffening of values for the purely chemical commodities. Last year *Chem. & Met.'s* weighted number stood at 180 as compared with 158.61 for the past week. This means a decline of about 12 per cent in the average value for chemicals and allied products.

The metal markets were easier last week and the salts reflected this, though no changes were made in the open quotations. Some competition is heard in the case of tin oxide and under the circumstances it is difficult to hold prices steady. Lead and zinc compounds are well controlled and the volume of business is regarded as satisfactory.

The presence of large stocks of arsenic in the spot market was emphasized during the week because of the low prices at which some goods were sacrificed. Makers of calcium arsenate are not buying arsenic at present and the outlook is uncertain. In the meantime foreign made arsenic is coming in regularly. Official returns place imports of arsenic, for the 8 months ended February, at 13,272,909 lb.

The alkali trade is quiet but domestic consumption has been good. Export sales have fallen off and this branch of the business is giving concern. Prices for export are irregular and sales are going through under 3c. per lb.

Acids

The movement of acids continues quiet with very little large lot buying. Mineral acids are easy in tone with large stocks on hand and values subject to negotiation. The lower prices for acetic acid which followed the recent decline in acetate of lime have had no effect on trading, as most large consumers are covered ahead. Tartaric and citric acids are attracting some attention but offerings are large and holders have been pressing sales and the price tone is easy. Lactic acid is reported to be selling freely and the market appears to be on a stable price basis. Oxalic acid is under pressure and competition among sellers has given buyers the benefit of low prices. Some resale oxalic changed hands considerably under the quoted market price of 10½c. per lb. An irregular market is reported for hydrofluoric acid. Demand is not heavy and producers are said to have given concessions in order to move stocks.

Potashes

Bichromate of Potash—There is nothing new in this market. Buying is not heavy but prices are on a steady basis.

Arsenic Sells at Lower Levels—Calcium Chloride Firm—Imported Copper Sulphate Easier—Bichromates Steady—Caustic Soda for Export Irregular—Prussiate of Soda Easy—Metal Salts Less Firm—Sal Ammoniac in Strong Position

Production has been kept on a parity with the consuming movement and sellers are not forced to press matters. Quotations range from 9½c. per lb. upward according to quantity.

Carbonate of Potash—There has been a steady undertone as recent buying reduced stocks. Hydrated is in fair demand and prices are quoted as firm at 6c. per lb. Calcined 96-98 per cent is offered at 6¼@6½c. per lb. The 80-85 per cent holds at 5¾@6c. per lb.

Caustic Potash—Many holders of imported caustic are asking 6¾c. per lb. It is possible, however, to buy at 6⅝c. per lb. Shipments from abroad were quoted at 6¼@6½c. per lb.

Permanganate of Potash — A fair business is reported in the domestic product with asking prices at 14@14½c. per lb. Imported permanganate for shipment has been above the spot price and this has checked interest of buyers. Spot holdings of imported also have been cut down and the price is largely nominal at 15c. per lb.

Prussiate of Potash—Red prussiate has been easier and according to some reports, it was possible to shade 40c. per lb. Yellow prussiate is quiet. Spot offerings are quoted at 19@20c. per lb., according to seller and quantity. Shipments are offered fractionally below the spot quotation.

Sodas

Acetate of Soda—There is a fairly steady movement to consumers with nothing to feature present buying. Resale material is not prominent and with first hands in control of the market, prices have been more stable. The tone, however, is not firm and 5@5½c. per lb. represents the quotation of producers.

Bichromate of Soda — Contract deliveries are reported to be going forward in a fairly normal way. It is admitted that some of the largest consuming industries are running on reduced schedules and naturally this tends to cut down demand for bichromate. The market is holding a steady course and producers appear to be carrying no large supplies. Prices are 7½c. per lb. and upward according to quantity.

Caustic Soda—Activity in this material is largely confined to filling old orders and this is sufficient to absorb a large part of production. Reports were current that one large producing plant had been closed and it is undoubtedly true that producers have been cutting down their output. Buying for export is not heavy. A moderate tonnage was sold last week under 3c. per lb., f.a.s. The quotation for export is unchanged at 3.05@3.10c. per lb., f.a.s. Government figures give exports in February an average price of slightly less than 3.05c. per lb. The contract price for domestic delivery is unchanged at 3.10c per lb., in carlots, at works.

Fluoride of Soda—A better call for supplies was heard and offerings of imported grades were not large. Values have shown a tendency to harden and spot goods were held at 9@9½c. per lb. This price can be shaded on forward positions. Domestic fluoride is quiet but holds at 10@10½c. per lb.

Nitrite of Soda—There is not much buying but arrivals of foreign nitrite are said to be passing direct to consumers and many of the latter are covered for the year. There are offerings of domestic nitrite on the market and prices are quoted at 8¼@8½c. per lb.

Prussiate of Soda—The lower prices which have been in effect have stimulated buying and some improvement is reported in the volume of sales. Imported prussiate on spot was offered at 10½c. per lb. and this price also was quoted for futures though it probably could be lowered on firm bid.

Soda Ash—While new business is not heavy, the call for deliveries on existing orders has gained and April deliveries are said to be of large volume. Some inquiry is noted for export but the amounts going out of the country suffer in comparison with the totals of last year. Prices are on a steady basis

and are: Light ash, in bulk, $1.25 per 100 lb.; in bags, $1.38 per 100 lb.; in bbl., $1.63 per 100 lb. Dense ash, in bulk, $1.35 per 100 lb.; in bags, $1.45 per 100 lb.; in bbl., $1.69 per 100 lb. These prices for carlots, f.o.b. works. Prompt shipments are 5@10c. per 100 lb. above the contract figures.

Miscellaneous Chemicals

Arsenic—Some holders of spot arsenic are reported to have cut prices in order to reduce their supplies. Sales are said to have been made as low as 9½c. per lb. The general quotation for spot was lower and was given as 10½@11c. per lb. Domestic producers were quoting 11c. per lb. Shipments from Japan were unchanged at 9½c. per lb. Makers of calcium arsenate were not buying arsenic and the outlook is still uncertain. Arsenate is moving against old orders but buyers are bidding below sellers' views and this restricts the volume of new business. Prices for arsenate are 11½@11¾c. per lb., at works.

Bleaching Powder—Most buyers of bleach are covered ahead and trading is slow because of that condition. Prices are being well maintained and there is considerable speculation regarding the stability of prices later in the season. Stocks are not so large as they were a year ago and it is certain that there will be no very large amounts to depress the market as was the case last year. The present price for bleach is $1.90 per 100 lb., in carlots, at works.

Copper Sulphate—Demand was disappointing and prices were barely steady on both the domestic and imported material. On the domestic sellers quote from 4.80@4.90c. per lb. on large crystals, carload basis. Imported was offered more freely, spot goods being available at 4½c. per lb. On shipment from abroad there were sellers at 4⅝c. per lb. The easier market for copper did not help matters any from the selling end.

Formaldehyde—Supplies are moving against existing contracts in a fairly large way, but new business was not particularly brisk. First hands quote 11c. per lb., carload basis, immediate shipment.

Calcium Chloride—Domestic makers report a good call for this material and steady prices obtained in all directions. On the fused, in drums, works, $21 was the trading basis. A feature in the market was the improvement in demand for foreign goods for immediate and nearby delivery. At the close importers held out for $20 per ton, with offerings light. Not so long ago imported sold down to $16 per ton, ex dock, New York.

Sal Ammoniac—Demand was good and prices held steady. Imported white, in casks, was available on spot at 6¾c. per lb. On material now afloat asking prices ranged from 6½@6⅝c. per lb. On shipment from the other side 6¼c. could have been done. Domestic, white, in bbl., held at 7½@7¾c. per lb.

Tin Salts—Further weakness was reported in the metal, but this brought out no additional changes in the salts. Tin oxide held at 58c. per lb., immediate delivery. Bichloride held at the recently reduced basis of 14c. per lb., and crystals at 35½c. per lb. Demand was quiet.

"Chem. & Met." Weighted Index of Chemical Prices

Base = 100 for 1913-14

This week	158.61
Last week	158.28
April, 1923	180.00
April, 1922	158.00
April, 1921	140.00
April, 1920	261.00
April, 1919	231.00
April, 1918	286.00

The moderate advance in the weighted index number was brought about by the uplift in crude cottonseed oil.

Alcohol

Unless some important change should occur in the market for raw materials distillers expect prices for denatured alcohol to hold on a steady basis. The demand has been less active, but no selling pressure was apparent so far as first hands were concerned. Completely denatured, formula No. 5, closed nominally at 44½c. per gal., in drums, carload lots, immediate shipment. There was no change in the position of U.S.P. ethyl spirits.

Methanol was unsettled in some directions, but no open revision in prices took place. Leading producers quote 92c. per gal., in drums, and 95c. per gal., in bbl., on the 97 per cent grade. Pure methanol, in tank cars, works, held at 90c. per gal. Demand was moderate and the undertone easy.

Coal-Tar Products

Refined Naphthalene Unsettled on Larger Offerings—Benzene Firm—Phenol Inactive and Undertone Barely Steady—Cresylic Quiet

WHILE some of the smaller producers of benzene raised their selling views on April 1, leading factors continued to quote the market as unchanged. Demand for benzene continues active, and, with production well sold up, the outlook favored sellers. A firm market also obtained for solvent naphtha, toluene and coal-tar pitch. Naphthalene, refined, was under pressure, notwithstanding improvement in demand. The stocks of naphthalene in some directions appear to be a little burdensome and offerings have come on the market at slightly lower prices. Cresylic acid was offered freely, but there was no change in prices. Phenol was inactive and spot material sold at 29c. per lb.; on futures the market was unsettled, with producers a little more anxious to take on contracts extending over the remainder of the year.

According to official information the imports of coal-tar chemicals for the 8 months ended with Feb. 29 were valued at $14,148,901, which compares with $8,079,541 for the corresponding period a year ago. The gain occurred chiefly in the division for crudes, the imports of dead or creosote oil for the 8 months period alone showing a valuation of $8,974,324.

Aniline Oil—Demand has been moderate, but with no accumulation in supplies the undertone of the market remains firm, leading producers asking 16c. per lb., drums extra, on carload business, immediate shipment from works. Aniline oil for red held nominally at 40c. per lb. Aniline salt was unchanged at 22@23c. per lb.

Beta-Naphthol—The market was described as steady, first hands asking 25c. per lb. on the technical grade, immediate shipment. On a round lot, however, it was possible to do 24c. per lb., nearby delivery.

Benzene—Leading producers reported prices as unchanged, but said that the undertone was firm and that they had little to offer, being sold ahead over the next month or so. Taking advantage of the situation, some of the smaller operators advanced prices 2c. per gal. on all grades, effective April 1. The bulk of the output is moving into the motor fuel channels. Pure benzene closed at 25@27c. per gal., tank cars, works, the price depending upon the seller and delivery. On the 90 per cent grade nominal quotations covering tank car shipments range from 23@25c. per gal. On the 90 per cent grade, in drums, spot New York, scattered lots changed hands at 31c. per gal.

Cresylic Acid—Offerings were plentiful and it was possible to obtain prompt shipment material at 65c. per gal. on the 95 per cent grade, and at 68@70c. per gal. on the 97 per cent grade.

Naphthalene—On carload business it was possible to secure immediate shipment refined flake at prices ranging from 5½@6c. per lb., the price depending upon the seller. The undertone was easy, selling pressure being in evidence in some quarters of the trade. On chips the market was nominal at 5c. per lb., carload basis. Imports of crude naphthalene for the 8 months ended Feb. 29 amounted to 11,888,589 lb., valued at $357,907, compared with 4,213,339 lb., valued at $81,254, for the corresponding period a year ago.

Phenol—U.S.P. material sold on spot in a small way at 29c. per lb. Futures were offered more freely and the market was more or less nominal at 26@28c. per lb., the price depending upon the quantity and seller. Demand was along routine lines only. The demand for phenolic resins has been less active.

Pitch—Production of coal-tar pitch is large, but the material has been finding a ready market. For the hard, prompt shipment, nominal quotations range from $25@$30 per ton, the inside figure obtaining on carload quantities, f.o.b. works.

Pyridine—Imports for the month of February amounted to 32,326 lb., valued at $16,756. Imports in January amounted to 45,137 lb. The market has steadied on higher cables from abroad and nominal prices now range from $3.75@$4.25 per gal.

Vegetable Oils and Fats

Lower Prices for China Wood and Palm Oils Attract Buyers—Crude Cottonseed Advances—Tallow Higher

INQUIRY for nearby material was better and a good volume of business was reported in soap making oils and fats. Palm oil sold for shipment from Africa at lower prices. Tallow was in steady demand and last sales went through at an advance of ¼c. per lb. More interest was shown by buyers of drying oils, china wood moving in a fairly large way at lower prices. There was buying of linseed oil for delivery over the next 2 months by both paint manufacturers and linoleum makers. Refiners supported cottonseed oil and both crude and refined moved upward. Rapeseed oil sold at higher figures.

Cottonseed Oil—On reports of improvement in cash demand, higher cotton and support from at least one refiner the market for cottonseed oil presented a firm appearance and closing prices on both crude and refined were from 40 to 50 points net higher for the week. Offerings of crude were limited, holders throughout the South taking a bullish view of the general situation. Bulls look for 175,000 bbl. consumption for the month of March. The Bureau of the Census will issue the March statement some time this week. In regard to April business talk is even more optimistic, some operators predicting that the consumption will approximate 200,000 bbl. But sentiment was not all bullish and there was some good selling on the advance. The action of lard did not encourage traders on the long side. Crude oil sold as high as 8¼c. per lb., tank cars, f.o.b. mills, Southeast. July refined oil in the option market on Thursday settled at 10.65c. per lb. Lard compound was offered at 11¾@12¼c. per lb., carload basis, f.o.b. New York, the price depending upon the seller. Export trade was dull.

Linseed Oil—One parcel of 10 carloads of raw linseed oil sold for May delivery at 88c. per gal., cooperage basis, indicating that the market underwent little change in the past week. Immediate shipment oil was offered at 90c. per gal., with April available at the same figure. Several crushers held out for 90c. on May business. It was reported that a linoleum maker purchased a round lot of May-June shipment in the English market on the bulk basis of 78c. per gal., delivered, duty paid. Stocks of oil in the hands of crushers were reported light and this accounted for some of the steadiness in prices. Inquiry for June forward oil was comparatively light and the market in the more distant positions was wholly nominal. The seed markets were unsettled, but continued weakness in cake had a tendency to steady oil values. Statistically the outlook favors buyers as the supply in sight is larger than a year ago. Imports of flaxseed for the 8 months ended Feb. 29 amounted to 9,158,677 bu., against 11,833,121 bu. for the corresponding period a year ago. Receipts of domestic flaxseed at the Northwestern terminals from Sept. 1 to date amounted to 13,700,000 bu., as against 7,500,000 bu. a year ago. The condition of the soil in the flax producing states is good and the outlook in Canada also is favorable.

China Wood Oil — Another sharp break occurred in the market, but some good buying on the part of varnish makers developed on the decline. Late in the week selling pressure was no longer apparent and a firmer feeling prevailed. Tank cars sold down to 12c. per lb., f.o.b. Pacific coast points. Spot oil, in tanks, sold at 13¼c. New York, with rumors of business at this figure for oil in cooperage. The market closed nominally at 14¼@15c. per lb., in bbl., New York.

Coconut Oil — Demand quiet, but prices steady in sympathy with copra. Ceylon type oil closed at 8⅝c. asked, tank car basis. On the Pacific coast sellers asked 8@8¼c. per lb., tank car basis, according to delivery. Imports of copra for the 8 months ended Feb. 29 amounted to 216,759,456 lb., compared with 198,277,530 lb. for the corresponding period a year ago.

Decrease in Vegetable Oil Imports for 8 Months

Total imports of vegetable oils for the 8 months ended Feb. 29 show a moderate reduction compared with the corresponding period a year ago. Official statistics follow:

	1923–24	1922–23
China wood, lb.	56,052,397	57,119,745
Coconut, lb.	105,197,724	153,440,367
Olive, edible, lb.	47,013,329	43,995,099
Olive, tech., gal.	3,535,959	2,904,297
Palm, lb.	60,550,490	57,461,547
Peanut, lb.	2,679,937	1,888,783
Rapeseed, gal.	1,154,306	1,048,596
Linseed, lb.	16,986,419	30,535,062
Soya, lb.	14,136,652	12,064,629
Whale, gal.	2,266,920	*129,854

* Beginning Sept. 22, 1922.

Corn Oil—The market was higher in sympathy with cottonseed oil. Business went through at 8⅞c. per lb., tank cars, Chicago, but late in the week 9c. was asked on crude.

Olive Oil—Denatured olive oil was firm at $1.25 per gal., in bbl. Prime green foots arrived in a large way and a little selling pressure developed in ex-dock material, sales taking place at 9⅛c. per lb. For ex-store goods the market held at 9¾@10c. per lb. On shipment from Italy 9⅝c. was asked.

Palm Oil — Soap makers took on round lots for shipment from Africa, Lagos selling down to 7c. per lb., c.i.f. New York and 6¾c. c.i.f. New Orleans. Niger sold at 6¼c., c.i.f. New York basis. Lagos on spot was in limited supply and small lots sold at a premium.

Palm Kernel Oil—There were offerings at 9c. per lb., in bbl., immediate delivery. Demand dull.

Rapeseed Oil—There was a good call on refined oil for April shipment from abroad and round lots sold at 83@84c. per gal. May shipment from the other side closed nominally at 82c. per gal. Spot oil sold at 92@94c. per gal. Market firm.

Tallow, Etc. — Soap makers were buyers of extra special tallow at 7¼c. per lb., ex plant, an advance of ¼c. There was a steady call for tallow all week. Choice greases also met with a good demand and firmer prices were reported, yellow closing at 6¾@7c. per lb., according to acidity. Oleo stearine sold at 9⅛c. per lb., an advance of ¼c. Extra No. 1 oleo oil easier at 12¼c. per lb., in bbl. Red oil, distilled and saponified, nominal at 8⅜@8½c. per lb., tank car basis.

Miscellaneous Materials

Antimony—Cheaper offerings from the East brought out selling pressure here and prices closed ⅜c. per lb. lower on the metal. Chinese and Japanese settled nominally at 9⅜@10c. per lb. Cookson's "C" grade nominal at 13½@13¾c. per lb. Chinese needle, lump, 8½@9c. per lb. White oxide, Chinese 9⅜@10c. per lb.

Casein—Offerings fairly large and prices barely steady at 11½@12c. per lb., according to quantity and seller. Imports of casein for the 8 months ended Feb. 29 amounted to 9,785,716 lb., valued at $1,359,103, which compares with 10,320,151 lb., valued at $1,800,671 for the corresponding period a year ago.

Glycerine—Market firm, dynamite closing at 16¼c. asked, New York territory, and at 16¼c. in the Chicago district, an advance of ¼@¾c. Chemically pure unchanged at 17c. per lb., carload basis, in drums, f.o.b. New York. Crude, soap lye, basis 80 per cent, loose, sold at 11c. per lb., in the West.

Naval Stores—Spirits of turpentine sold at $1 per gal. Exports for the 8 months ended Feb. 29 were 7,869,703 gal., against 5,630,901 gal. for the same period a year ago. Rosins steady, the lower grades settling at $5.80 per bbl. Exports of rosin for the 8 months period 783,792 bbl. of 500-lb., against 607,627 bbl. a year ago.

Shellac—Slight improvement in trading and prices held steady, T.N. closing at 57c. per lb. Imports for the 8 months ended Feb. 29 were 20,036,079 lb., valued at $10,787,319, which compares with 17,936,853 lb., valued at $11,136,788 for the corresponding period a year ago. The Calcutta market was steady.

White Lead—Lower prices prevailed for the metal, but there was no change in the market for pigments. Pig lead was lowered to 8½c. per lb., which compares with 9c. the "official" price named a week ago. Lead sold as low as 8.10c. per lb., St. Louis. Buying interest in forward material lacking. The situation in pigments continues favorable, demand opening up at this season of the year. Corroders quote standard dry white lead on the basis of 10¼c. per lb., in casks, carload lots.

Zinc Oxide—The market was moderately active, but with no important change in the metal, prices were just about steady. American process, zinc oxide, lead free, held at 7¾c. per lb., with the 5 per cent lead sulphate at 7¼c. per lb. French process, red seal 9¾c. per lb., and green seal at 10¾c. per lb.

Imports at the Port of New York

April 4 to April 10

ACIDS—Citric—200 bbl., Messina, Brown Bros. & Co. **Oxalic**—25 csk., Hamburg, Chemical National Bank; 40 bbl., Hamburg, Order.

ALBUMEN — 10 bbl., Trieste, Farmers Loan & Trust Co.; 11 cs., Tientsin, Detterman & Co.

AMMONIUM CARBONATE — 100 csk., Hamburg, Order.

ANTIMONY—100 cs., Hamburg, Farmers Loan & Trust Co.; 500 cs. regulus, Shanghai, International Banking Corp.

ARSENIC — 400 cs., Kobe, American Trading Co.; 400 cs. Kobe, Gravely & Co.; 400 cs., Kobe, National City Bank; 48 cs., Kobe, N. Y. Trust Co.; 117 cs., Kobe, Corn Exchange Bank; 51 cs., Kobe, Frazar & Co.; 500 cs., Kobe, Order.

BARIUM CARBONATE—170 bg., Hamburg, Seaboard National Bank.

BARIUM NITRATE—37 csk., Hamburg, Philadelphia National Bank.

BARYTES—56 bbl., Rotterdam, Schaal Color & Chemical Co.

CADMIUM — 10 cs., Hamburg, M. E. Whitehead.

CAMPHOR—200 cs., Shanghai, Suzuki & Co.; 254 cs., Shanghai, Irving Bank-Col. Trust Co.

CASEIN—417 bg., Buenos Aires, Bank of America; 767 bg. Buenos Aires, Order.

CHALK—460 bg., Bristol, H. J. Baker & Bro.; 500 tons, Southampton, Taintor Trading Co.

CHEMICALS—56 csk., Glasgow, Frazar & Co.; 224 bg., Glasgow, Brown Bros. & Co.; 96 pkg., Rotterdam, Order; 300 bbl., Marseilles, Pomeroy & Fischer; 147 dr., Hamburg, Roessler & Hasslacher Chemical Co.; 20 cs., Havre, E. Fougera & Co.

CHINA CLAY — 2,254 tons (bulk), Fowey, Pickfords Colonial, Inc.; 1,240 bg., Fowey, Order; 70 bg., Fowey, Cooper & Cooper; 25 bg., Fowey, C. D. Wagner & Co.; 249 csk., Fowey, Pickfords Colonial, Inc.

COAL-TAR DISTILLATE—60 dr., Glasgow, Order.

COLORS—2 csk. aniline, Rotterdam, H. A. Metz & Co.; 57 bbl. earth, Hamburg, J. Lee Smith & Co.; 5 csk., Havre, G. W. Sheldon & Co.; 21 pkg. aniline, Havre, Ciba Co.; 10 csk. do., Havre, Carbic Color & Chemical Co., 1 cs. do., Havre, Order; 6 pkg. do., Southampton, American Exchange National Bank.

COPPER OXIDE—25 dr., Hamburg, Order.

COPPER SULPHATE—100 csk., Hamburg, Order.

CREAM TARTAR—25 keg, Genoa, Austin, Nichols & Co.; 200 csk., Marseilles, Guaranty Trust Co.; 50 csk., Marseilles, French-American Baking Co.

DEXTRINE — 150 bg., Rotterdam, De Twentsche Bank.

DIVI-DIVI—283 bg., Maracaibo, F. Hub Co.; 234 bg., Maracaibo, Standard Bank of South Africa.

FULLERS EARTH—150 bg., Bristol, L. A. Salomon & Bro.

GAMBIER—513 cs., Singapore, L. Littlejohn & Co.; 850 cs., Asahan, Order.

GALLNUTS—250 cs., Hankow, Zinsser & Co.; 500 cs., Hankow, Mallinckrodt Chemical Works.

GLAUBER SALT—128 csk., E. Suter & Co.; 250 bg., Hamburg, Roessler & Hasslacher Chemical Co.; 137 bbl., Hamburg, Order.

GLYCERINE — 10 dr., Havana, C. J. Schelling & Co.; 50 dr., London, Marx & Rawolle.

GRAPHITE—50 bg., Havre, Order.

GUMS—1,941 bg. kauri, Auckland, Order; 96 pkg. copal, Manila, Chartered Bank of India, Australia & China; 100 cs. damar, Batavia, A. Klipstein & Co.; 140 bg. copal, Singapore, Baring Bros. & Co.; 50 cs. copal and 138 bg. damar, Singapore, Brown Bros. & Co.; 100 cs. damar and 140 bg. copal, Singapore, Guaranty Trust Co.; 274 bg. damar and 140 bg. copal, Singapore, L. C. Gillespie & Son; 50 bg. copal, Singapore, France, Campbell & Darling; 242 pkg. copal, Singapore, Chemical National Bank; 140 bg. copal, Singapore, Order; 650 sk. kauri, Auckland, Chase National Bank; 60 cs. do., Auckland, Chemical National Bank; 50 cs. do., Auckland, Baring Bros. & Co.; 341 cs. do., Auckland, Guaranty Trust Co.; 293 cs. do., Auckland, Standard Bank of South Africa; 26 bg. do., Auckland, Fourth Street National Bank; 744 cs. and 463 sk., Auckland, Order.

IRON OXIDE—114 bbl., Malaga, C. J. Osborn & Co.; 100 bbl., Malaga, Stanley, Daggett, Inc.; 200 bbl., Malaga, A. D. Strauss & Co.; 76 bbl., Malaga, C. K. Williams & Co.; 75 bbl., Malaga, A. Rittwagen; 210 bg., Bristol, G. Z. Collins & Co.; 85 csk., Bristol, Order; 15 csk., Hamburg, Reichard-Coulston, Inc.

LEAD SUGAR — 12 csk., Hamburg, Roessler & Hasslacher Chemical Co.

Opportunities in the Foreign Trade

Parties interested in any of the following opportunities may obtain all available information from the Bureau of Foreign and Domestic Commerce at Washington or from any district office of the bureau. The number placed after the opportunity must be given for the purpose of identification.

HYDROGEN PEROXIDE in bottles, Winnipeg, Canada. Purchase.—9770.

NAPHTHALINE in balls and flakes. Winnipeg, Canada. Purchase.—9770.

RADIUM SALTS and radium ores, best quality. Hamburg, Germany. Purchase.—9757.

PARAFFIN WAX for candle making. Damascus, Syria. Purchase and agency.—9794.

CANDLES. Belfast, Ireland. Purchase and agency.—9796.

MAGNESITE — 313 bg., Rotterdam, Speiden, Whitfield & Co.; 250 bg. and 42 bbl. A. Kramer & Co.

MAGNESIUM CHLORIDE — 328 bbl., Hamburg, Order.

MANGANESE — 34 csk., Hamburg, C. Hardy, Inc.; 688 tons ore, Seccondee, National Carbon Co.

MYROBALANS — 655 pkt., Calcutta, Order.

OCHER—338 bbl., Marseilles, American Exchange National Bank; 280 bbl., Marseilles, Reichard-Coulston, Inc.

OILS—Cod—35 bbl., St. Johns, Order; 500 bbl., Glasgow, Order. **China Wood**—100 dr., Hong Kong, Order; 142 bbl., Hankow, International Acceptance Bank; 300 bbl., Hankow, Mitsui & Co.; 145 csk., Hankow, F. A. Cundill & Co.; 289 csk., Hankow, G. W. S. Patterson & Co. **Coconut**—853 tons (in bulk, Manila, Spencer Kellogg & Sons. **Olive Foots** (sulphur oil)—300 bbl., Naples, National City Bank; 100 bbl., Palermo, Ellis, Jackson & Co.; 100 bbl., Palermo, Order; 115 bbl., Malaga, National City Bank; 900 bbl., Bari, Ellis, Jackson & Co.; 600 bbl., Bari, Fourth Street National Bank; 200 bbl., Bari, Bank of the Manhattan Co.; 450 bbl., Bari, Philadelphia National Bank; 350 bbl., Bari, National City Bank; 100 bbl., Bari, The Ribreest; 400 bbl., Bari, W. Schall & Co.; 2 tanks, Bari, Palmolive Co.; 400 bbl., Bari, Order; 300 bbl., Seville, National City Bank; 65 puns and 200 bbl., Seville, Philadelphia Nat'l Bank; 900 bbl., Seville, Bank of the Manhattan Co.; 100 bbl., Barcelona, Chemical National Bank. **Palm**—100 csk., Port Harcourt, Niger Co.; 150 csk., Opobo, Niger Co.; 158 csk., Abonema, Order; 336 csk., Buruti, Irving Bank-Col. Trust Co.; 320 csk., Sapele, Niger Co.; 320 csk., Warri, Niger Co.; 235 csk., Lagos, Irving Bank-Col. Trust Co.; 77 csk., Lagos, J. Holt & Co. **Sardine**—400 bbl., Kobe, International Banking Corp.; 500 bbl., Kobe, Bank of America; 800 bbl., Kobe, Order. **Sesame**—100 csk., Marseilles, Order; 145 bbl., Rotterdam, J. P. Grant & Co.; 100 csk., Marseilles, Order.

OIL SEEDS — Linseed — 73,835 bg., Buenos Aires, American Linseed Co.; 4,471,097 lb., Rosario, Spencer, Kellogg & Sons. **Sesame**—1,400 bg. white, Hankow, Irving Bank-Col. Trust Co.

POTASSIUM SALTS—20 bbl. cyanide, Trieste, Order; 61 csk. carbonate, Hamburg, Peters, White & Co.; 160 dr. caustic, Hamburg, A. Klipstein & Co.; 75 dr. caustic, Hamburg, Peters, White & Co.; 90 bbl. salts, Hamburg, Amermann & Patterson; 12 csk. sulphate, Hamburg, Roessler & Hasslacher Chemical Co.; 78 bbl. alum, Hamburg, Order; 750 bg. nitrate, Calcutta, Order.

PLUMBAGO—183 bbl., Colombo, Order.

PUMICE — 361 bg., Canneto Lipari, Bankers Trust Co.; 215 bg. powdered, 2,882 bg. lump and 5 csk. do., Canneto Lipari, Gallagher & Ascher; 236 pkg., Canneto Lipari, Order.

QUEBRACHO—7,840 bg., Buenos Aires, Beekman, Winthrop Co.

QUICKSILVER—22 flasks, Tampico, G. Ramos.

SAL AMMONIAC—110 csk., Rotterdam, Kuttroff, Pickhardt & Co.; 43 csk., Hamburg, E. Suter & Co.; 37 bbl., Hamburg, Brown Bros. & Co.; 104 csk., Hamburg, Meteor Products Co.; 37 csk., Hamburg, Meteor Products Co.; 34 csk., Hamburg, Roessler & Hasslacher Chemical Co.

SHELLAC—140 cs., Marseilles, Order; 1,341 bg., 116 bg. seedlac, 1 bg. buttonlac, Calcutta, Order; 2,182 bg., 500 bg. refuse and 210 bg. seedlac, Calcutta, Order; 100 bg. London, Ralli Bros.; 514 bg., London, Order.

SILVER SULPHIDE — 93 cs., Antofagasta, Watson, Geach & Co.

SODIUM SALTS—224 cs. cyanide, Marseilles, International Banking Corp.; 7 csk. silicate, Glasgow, Pike Mfg. Co.; 100 bbl. nitrite, Hamburg, E. Suter & Co.; 200 bbl., Hamburg, Brown Bros. & Co.; 40 csk. fluoride, Hamburg, E. Suter & Co.; 117 dr. sulphite, Hamburg, T. S. Grant & Co.; 149 csk. nitrate, Hamburg, Order; 100 cs. bromide, Hamburg, Order; 10,920 bg. nitrate, Mejillones, A. Gibbs & Co.; 14,268 bg. nitrate, Mejillones, Wessel, Duval & Co.; 7,096 bg. do., Iquique, E. I. du Pont de Nemours & Co.; 13,609 bg. do., Iquique, Wessel, Duval & Co.; 203 cs. cyanide, West Australia, Booth American Shipping Co.; 7,197 bg. nitrate, Antofogasta, W. R. Grace & Co.; 17,439 bg. do., Iquique, W. R. Grace & Co.

STRONTIUM CARBONATE — 76 csk., Hamburg, W. Schall & Co.

SUMAC—700 bg. ground, Palermo, Bank of New York & Trust Co.; 350 bg., Palermo, R. Neumann; 700 bg., Palermo, Order.

TARTAR—75 csk., Naples, Tartar Chemical Works; 599 bg., Marseilles, C. Pfizer & Co.; 105 bg., Marseilles, Tartar Chemical Works; 40 csk., Hamburg, U. S. Navigation Co.; 105 bg., Marseilles, Order.

WAXES—112 bg. beeswax, Valparaiso, L. Luxardo & Co.; 36 bg. do., Valparaiso, Guaranty Trust Co.; 469 pkg. beeswax, Lisbon, Order; 100 bg. carnauba, Pernambuco, Order; 38 bg. do., Parnahyba, National City Bank; 223 bg. do., Parnahyba, Lazard Freres; 210 cs. beeswax, Havre, Lazard Freres; 25 bg. beeswax, Havana, W. H. Bowdlear & Co.; 50 bg. beeswax, Havana, Order.

ZINC CHLORIDE—107 bbl., Rotterdam, Order.

ZINC SULPHIDE—2 csk., Southampton, C. A. Sykes.

Current Prices in the New York Market

For Chemicals, Oils and Allied Products

THESE prices are for the spot market in New York City, but a special effort has been made to report American manufacturers' quotations whenever available. In many cases these are for material f.o.b. works or on a contract basis and these prices are so designated. Quotations on imported stocks are reported when they are of sufficient importance to have a material effect on the market. Prices quoted in these columns apply to large quantities in original packages.

General Chemicals

Acetone, drums, wks	lb.	$0.16	$0.17
Acetic anhydride, 85%, dr.	lb.	.38	....
Acid, acetic, 28%, bbl	100 lb.	3.37	3.62
Acetic, 56%, bbl	100 lb.	6.35	6.60
Acetic, 80%, bbl	100 lb.	8.90	9.15
Glacial, 99¼%, bbl	100 lb.	11.90	12.15
Boric, bbl	lb.	.10	....
Citric, kegs	lb.	.46	.47
Formic, 85%	lb.	.13	.13½
Gallic, tech	lb.	.45	.50
Hydrofluoric, 52%, carboys	lb.	.11	.12
Lactic, 44%, tech., light, bbl	lb.	.12½	.13
22% tech., light, bbl	lb.	.06	.06½
Muriatic, 18° tanks	100 lb.	.80	.85
Muriatic, 20°, tanks	100 lb.	.95	1.00
Nitric, 36°, carboys	lb.	.04	.04½
Nitric, 42°, carboys	lb.	.04¾	.05¼
Oleum, 20%, tanks	ton	16.00	17.00
Oxalic, crystals, bbl	lb.	.10½	.11
Phosphoric, 50% carboys	lb.	.07½	.08½
Pyrogallic, resublimed	lb.	1.55	1.60
Sulphuric, 60°, tanks	ton	9.00	10.00
Sulphuric, 60°, drums	ton	13.00	14.00
Sulphuric, 66°, tanks	ton	14.00	15.00
Sulphuric, 66° drums	ton	19.00	20.00
Tannic, U.S.P., bbl	lb.	.65	.70
Tannic, tech., bbl	lb.	.45	.50
Tartaric, imp., powd., bbl.	lb.	.27	.28
Tartaric, domestic, bbl	lb.	.30	....
Tungstic, per lb	lb.	1.20	1.25
Alcohol, butyl, drums, f.o.b. works	lb.	.25	.30
Alcohol ethyl (Cologne spirit), bbl	gal.	4.85	....
Ethyl, 190 p'f. U.S.P., bbl	gal.	4.81	....
Alcohol, methyl (see Methanol)			
Alcohol, denatured, 190 proof			
No. 1, special bbl	gal.	.51½	...
No. 1, 190 proof, special, dr.	gal.	.45½	...
No. 1, 188 proof, bbl	gal.	.52½	...
No. 1, 188 proof, dr	gal.	.48½	...
No. 5, 188 proof, bbl	gal.	.50½	...
No. 5, 188 proof, dr	gal.	.44½	...
Alum, ammonia, lump, bbl	lb.	.03½	.04
Potash, lump, bbl	lb.	.03½	.04
Chrome, lump, potash, bbl.	lb.	.05½	.06
Aluminum sulphate, com., bags	100 lb.	1.40	1.50
Iron free bags	lb.	2.40	2.50
Aqua ammonia, 26°, drums	lb.	.06½	.06¾
Ammonia, anhydrous, cyl	lb.	.28	.30
Ammonium carbonate, powd. tech., casks	lb.	.12	.13
Ammonium nitrate, tech., casks	lb.	.09	.10
Amyl acetate tech., drums	gal.	3.25	3.75
Antimony oxide, white, bbl.	lb.	.09½	.10
Arsenic, white, powd., bbl	lb.	.10¼	.11
Arsenic, red, powd., kegs	lb.	.14½	.15
Barium carbonate, bbl	ton	67.00	68.00
Barium chloride, bbl	ton	85.00	90.00
Barium dioxide, 88%, drums	lb.	.17½	.18
Barium nitrate, casks	lb.	.08	.08½
Blanc fixe, dry, bbl	lb.	.03¾	.04
Bleaching powder, f.o.b. wks., drums	100 lb.	1.90	....
Spot N. Y. drums	100 lb.	2.25	2.35
Borax, bbl	lb.	.05½	.05¾
Bromine, cases	lb.	.28	.30
Calcium acetate, bags	100 lb.	3.50	3.55
Calcium arsenate, dr	lb.	.11	.11¾
Calcium carbide, drums	lb.	.05	.05½
Calcium chloride, fused, dr. wks.	ton	21.00	....
Gran. drums works	ton	27.00	....
Calcium phosphate, mono, bbl	lb.	.06½	.07
Camphor, Jap. cases	lb.	.76	.76½
Carbon bisulphide, drums	lb.	.06	.06½
Carbon tetrachloride, drums	lb.	.07½	.08
Chalk, precip.—domestic, light, bbl	lb.	.04½	.04¾
Domestic, heavy, bbl	lb.	.03½	.04
Imported, light, bbl	lb.	.04½	.05
Chlorine, liquid, tanks, wks.	lb.	.04½	....
Contract, tanks, wks	lb.	.04½	....
Cylinders, 100 lb., wks	lb.	.05½	.07½
Chloroform, tech., drums	lb.	.30	.32
Cobalt, oxide, bbl	lb.	2.10	2.25
Copperas, bulk, f.o.b. wks	ton	16.00	18.00
Copper carbonate, bbl	lb.	.17½	.18
Copper cyanide, drums	lb.	.45	.46
Coppersulphate, dom., bbl.	100 lb.	4.85	5.00
Imp bbl	100 lb.	4.50	4.60
Cream of tartar bbl	lb.	.21	.22
Epsom salt, dom., tech., bbl	100 lb.	1.75	2.00
Epsom salt, imp., tech., bags	100 lb.	1.10	1.15
Epsom salt, U.S.P., dom., bbl	100 lb.	2.25	2.50
Ether, U.S.P., dr	lb.	.14	.15
Ethyl acetate, 85%, drums	gal.	1.00	....
Ethyl acetate, 99%, dr	gal.	$1.15	....
Formaldehyde, 40%, bbl	lb.	.11	.11½
Fullers earth—f.o.b. mines	ton	7.50	18.00
Furfural, works, bbl	lb.	.25	....
Fusel oil, ref., drums	gal.	3.50	....
Fusel oil, crude, drums	gal.	2.50	2.75
Glaubers salt, wks., bags	100 lb.	1.20	1.40
Glaubers salt, imp., bags	100 lb.	.95	1.05
Glycerine, c.p., drums extra	lb.	.17	....
Glycerine, dynamite, drums	lb.	.16½	16½
Glycerine, crude 80%, loose	lb.	.11	11½
Hexamethylene, drums	lb.	.68	.75
Lead:			
White, basic carbonate, dry, casks	lb.	.10½	....
White, basic sulphate, casks	lb.	.09¼	....
White, in oil, kegs	lb.	.12½	....
Red, dry, casks	lb.	.12	....
Red, in oil, kegs	lb.	.13½	....
Lead acetate, white crys., bbl.	lb.	.15	....
Brown, broken, casks	lb.	.14	....
Lead arsenate, powd., bbl	lb.	.18	.20
Lime-Hydrated, bg, wks	ton	10.50	12.50
Bbl., wks	ton	18.00	19.00
Lime, Lump, bbl	280 lb.	3.63	3.65
Litharge, comm., casks	lb.	.11	....
Lithopone, bags	lb.	.06½	.06½
Magnesium carb., tech., bags	lb.	.08½	.08½
Methanol, 95%, bbl	gal.	.93	....
Methanol, 97%, bbl	gal.	.95	....
Methanol, pure, tanks	gal.	.90	....
drums	gal.	1.00	....
bbl	gal.	1.05	....
Methyl-acetone, t'ks	gal.	.90	.91
Nickel salt, double, bbl	lb.	.09½	.10½
Nickel salts, single, bbl	lb.	.10	.11
Orange mineral, csk	lb.	.14½	.15½
Phosgene		.60	.75
Phosphorus, red, cases	lb.	.70	.75
Phosphorus, yellow, cases	lb.	.35	.40
Potassium bichromate, casks	lb.	.09¼	.09½
Potassium bromide, gran., bbl	lb.	.19	.20
Potassium carbonate, 80-85%, calcined, casks	lb.	.06½	.06½
Potassium chlorate, powd	lb.	.07½	.08½
Potassium cyanide, drums	lb.	.47	.52
Potassium, first sorts, cask	lb.	.07½	.08
Potassium hydroxide (caustic potash) drums	lb.	.06½	.06¾
Potassium iodide, cases	lb.	3.65	3.75
Potassium nitrate, bbl	lb.	.07½	.09
Potassium permanganate, drums	lb.	.14	.14½
Potassium prussiate, red, casks	lb.	.43	.45
Potassium prussiate, yellow, casks	lb.	.19	.19½
Salammoniac, white, gran., casks, imported	lb.	.06½	....
Salammoniac, white, gran., bbl., domestic	lb.	.07½	.07¾
Gray, gran., casks	lb.	.08	.09
Salsoda, bbl	100 lb.	1.20	1.40
Salt cake (bulk) works	ton	22.00	....
Soda ash, light, 58% flat, bulk, contract	100 lb.	1.25	....
bags, contract	100 lb.	1.38	....
Soda ash, dense, bulk, contract, basis 58%	100 lb.	1.35	....
bags, contract	100 lb.	1.45	....
Soda, caustic, 76%, solid, drums contract	100 lb.	3.10	....
Soda, caustic, ground and flake, contracts, dr	100 lb.	3.50	3.85
Soda, caustic, solid, 76% f. a.s. N. Y	100 lb.	3.00	....
Sodium acetate, works, bbl	lb.	.05	.05½
Sodium bicarbonate, bulk	100 lb.	1.75	....
330-lb. bbl	100 lb.	2.00	....
Sodium bichromate, casks	lb.	.07½	.07¾
Sodium bisulphate (niter cake)	ton	6.00	7.00
Sodium bisulphite, powd., U.S.P., bbl	lb.	.04½	.04½
Sodium chlorate, kegs	lb.	.06½	.07
Sodium chloride	long ton	12.00	13.00
Sodium cyanide, cases	lb.	.19	.22
Sodium fluoride, bbl	lb.	$0.09	$0.10½
Sodium hyposulphite, bbl	lb.	.02½	.02¾
Sodium nitrite, casks	lb.	.08½	.08½
Sodium peroxide, powd., cases	lb.	.28	.30
Sodium phosphate, dibasic, bbl	lb.	.03½	.03¾
Sodium prussiate, yel. bbl	lb.	.10½	.12
Sodium salicylic, drums	lb.	.38	.40
Sodium silicate (40°, drums)	100 lb.	.75	1.15
Sodium silicate (60°, drums)	100 lb.	1.75	2.00
Sodium sulphide, fused, 60-62% drums	lb.	.03¾	.03¾
Sodium sulphite, crys., bbl	lb.	.03½	.03¾
Strontium nitrate, powd., bbl.	lb.	.10	.10½
Sulphur chloride, yel drums	lb.	.04½	.05
Sulphur, crude	ton	18.00	20.00
At mine, bulk	ton	16.00	18.00
Sulphur, flour, bag	100 lb.	2.25	2.35
Sulphur, roll, bag	100 lb.	2.00	2.10
Sulphur dioxide, liquid, cyl	lb.	.08	.08
Tin bichloride, bbl	lb.	.14	....
Tin oxide, bbl	lb.	.58	....
Tin crystals, bbl	lb.	.35½	....
Zinc carbonate, bags	lb.	.14	.14½
Zinc chloride, gran, bbl	lb.	.05	.05½
Zinc cyanide, drums	lb.	.36½	.37
Zinc dust, bbl	lb.	.08	.08½
Zinc oxide, lead free, bag	lb.	.07½	....
5% lead sulphate, bags	lb.	.07½	....
10 to 35 % lead sulphate, bags	lb.	.07	....
French, red seal, bags	lb.	.09½	....
French, green seal, bags	lb.	.10½	....
French, white seal, bbl	lb.	.12	....
Zinc sulphate, bbl	100 lb.	3.00	3.25

Coal-Tar Products

Alpha-naphthol, crude, bbl	lb.	$0.60	$0.65
Alpha-naphthol, ref., bbl	lb.	.70	.75
Alpha-naphthylamine, bbl	lb.	.35	.36
Aniline oil, drums	lb.	.16	.16½
Aniline salts, bbl	lb.	.22	.23
Anthracene, 80%, drums	lb.	.75	.80
Anthraquinone, 25%, paste, drums	lb.	.75	.80
Benzaldehyde U.S.P., carboys	lb.	1.50	....
f.f.c. drums	lb.	1.60	....
tech, drums	lb.	68	.72
Benzene, pure, water-white, tanks, works	gal.	.25	....
Benzene, 90%, tanks, works	gal.	.23	....
Benzidine base, bbl	lb.	.80	.82
Benzidine sulphate, bbl	lb.	.70	.72
Benzoic acid, U.S.P., kegs	lb.	.82	.85
Benzoate of soda, U.S.P., bbl.	lb.	.65	.70
Benzyl chloride, 95-97%, ref., carboys	lb.	.35	....
Benzyl chloride, tech., drums	lb.	.25	....
Beta-naphthol, tech., bbl	lb.	.25	.26
Beta-naphthylamine, tech	lb.	.65	.70
Cresol, U.S.P., drums	lb.	.23	.28
Ortho-cresol, drums	lb.	.28	.32
Cresylic acid, 97%, works drums	gal.	.68	.72
95-97%, drums, works	gal.	.65	.68
Dichlorbenzene, drums	lb.	.07	.08
Diethylaniline, drums	lb.	.53	.55
Dimethylaniline, drums	lb.	.36	.38
Dinitrobenzene, bbl	lb.	.18	.20
Dinitrochlorbenzene, bbl	lb.	.21	.22
Dinitronaphthalen, bbl	lb.	.30	.32
Dinitrophenol, bbl	lb.	.35	.40
Dinitrotoluen, bbl	lb.	.20	.22
Dip oil, 25%, drums	gal.	.26	.28
Diphenylamine, bbl	lb.	.50	.52
H-acid, bbl	lb.	.72	.75
Meta-phenylenediamine, bbl.	lb.	.95	1.00
Michlers ketone, bbl	lb.	3.00	3.50
Monochlorbenzene, drums	lb.	.08	.10
Monoethylaniline, drums	lb.	.95	1.10
Naphthalene, flake, bbl	lb.	.05½	.06
Naphthalene, balls, bbl	lb.	.06½	.07
Naphthionate of soda, bbl	lb.	.60	.65
Naphthionic acid, crude, bbl.	lb.	.60	.62
Nitrobenzene, drums	lb.	.09	.09½
Nitro-naphthalene, bbl	lb.	.25	.30
Nitro-toluene, drums	lb.	.13½	.14
N-W acid, bbl	lb.	1.05	1.10
Ortho-amidophenol, kegs	lb.	2.40	2.50
Ortho-dichlorbenzene, drums	lb.	.10	.15
Ortho-nitrophenol, bbl	lb.	1.25	1.30
Ortho-nitrotoluene, drums	lb.	.11	.12
Ortho-toluidine, bbl	lb.	.13	.14
Para-aminophenol, base, kegs	lb.	1.25	1.35
Para-aminophenol, HCl, kegs	lb.	1.45	1.60
Para-dichlorbenzene, bbl	lb.	.17	.20
Paranitraniline, bbl	lb.	.68	.70
Para-nitrotoluene, bbl	lb.	.58	.60
Para-phenylenediamine, bbl.	lb.	1.40	1.50
Para-toluidine, bbl	lb.	.76	.83
Phthalic anhydride, bbl	lb.	.30	.34
Phenol, U.S.P., dr	lb.	.26	.29
Picric acid, bbl	lb.	.20	.22
Pyridine, dom., drums	gal.	nominal	
Pitch, tanks, works	ton	25.00	30.00
Pyridine, imp., drums	gal.	3.75	4.00
Resorcinol, tech., kegs	lb.	1.30	1.40

Resorcinol, pure, kegs	lb.	$2.05 –	$2.10
R-salt, bbl.	lb.	.55 –	.60
Salicylic acid, tech., bbl.	lb.	.32 –	.33
Salicylic acid, U.SP., bbl.	lb.	.35 –	...
Solvent naphtha, water-white, tanks	gal.	.25 –	....
Crude, tanks	gal.	.22 –	....
Sulphanilic acid, crude, bbl.	lb.	.16 –	.18
Tolidine, bbl.	lb.	1.00 –	1.05
Toluidine, mixed, kegs	lb.	.30 –	.35
Toluene, tank cars, works	gal.	.26 –	....
Toluene, drums, works	gal.	.30 –	....
Xylidine, drums	lb.	.50 –	....
Xylene, pure, tanks	gal.	.40 –	....
Xylene, com., tanks	gal.	.28 –	....

Naval Stores

Rosin B-D, bbl. 280 lb.		$5.80 –	....
Rosin E-I, bbl. 280 lb.		5.80 –	....
Rosin K-N, bbl. 280 lb.		5.90 –	$6.10
Rosin W.G.-W.W., bbl. 280 lb.		7.00 –	7.40
Wood rosin, bbl. 280 lb.		5.80 –	5.90
Turpentine, spirits of, bbl.	gal.	1.00 –	.....
Wood, steam dist., bbl.	gal.	.90 –	.....
Wood, dest. dist., bbl.	gal.	.70 –	.....
Pine tar pitch, bbl. 200 lb.		5.50 –	.....
Tar, kiln burned, bbl. 500 lb.		11.00 –	.....
Retort tar, bbl. 500 lb.		11.00 –	.....
Rosin oil, first run, bbl.	gal.	.41 –	.....
Rosin oil, second run, bbl.	gal.	.45 –	.....
Rosin oil, third run, bbl.	gal.	.47 –	.....
Pine oil, steam dist.	gal.	.65 –	.....
Pine tar oil, ref.	gal.	.50 –	.....

Animal Oils and Fats

Degras, bbl.	lb.	$0.03½ –	$0.05½
Grease, yellow, loose	lb.	.06½ –	.07
Lard oil, Extra No. 1, bbl.	gal.	.85 –	.....
Lard compound, bbl.	lb.	.11½ –	.12
Neatsfoot oil 20 deg. bbl.	gal.	1.28 –	.....
No. 1, bbl.	gal.	.88 –	.92
Oleo Stearine	lb.	.09½ –	.....
Oleo oil, No. 1, bbl.	lb.	.12½ –	.....
Red oil distilled, d.p. bbl.	lb.	.08½ –	.08¾
Saponified, bbl.	lb.	.08¼ –	.08½
Tallow, extra, loose	lb.	.07¼ –	.....
Tallow oil, acidless, bbl.	gal.	.83 –	.....

Vegetable Oils

Castor oil, No. 3, bbl.	lb.	$0.15 –	.....
Castor oil, No. 1, bbl.	lb.	.15½ –	.....
Chinawood oil, bbl.	lb.	.14 –	.15
Coconut oil, Ceylon, bbl.	lb.	.09¾ –	.....
Ceylon, tanks, N.Y.	lb.	.08¾ –	.....
Coconut oil, Cochin, bbl.	lb.	.10 –	.10½
Corn oil, crude, bbl.	lb.	.10½ –	.11
Crude, tanks, (f.o.b. mill)	lb.	.09 –	.....
Cottonseed oil, crude (f.o.b. mill), tanks	lb.	.08¼ –	.08¾
Summer yellow, bbl.	lb.	.10½ –	.....
Winter yellow, bbl.	lb.	.11½ –	.11¾
Linseed oil, raw, car lots, bbl.	gal.	.90 –	.....
Raw, tank cars (dom.)	gal.	.84 –	.....
Boiled, cars, bbl. (dom.)	gal.	.92 –	.....
Olive oil, denatured, bbl.	gal.	1.25 –	1.30
Sulphur, (foots) bbl.	lb.	.09½ –	.10
Palm, Lagos, casks	lb.	.07¼ –	.07½
Niger, casks	lb.	.06¼ –	.....
Palm kernel, bbl.	lb.	.09¼ –	.09½
Peanut oil, crude, tanks (mill)	lb.	.11¼ –	.....
Peanut oil, refined, bbl.	lb.	.14¼ –	.15
Perilla, bbl.	lb.	.14¼ –	.14¾
Rapeseed oil, refined, bbl.	gal.	.92 –	.94
Sesame, bbl.	lb.	.11¼ –	.11½
Soya bean (Manchurian), bbl.	lb.	.11¼ –	.....
Tank, f.o.b. Pacific coast	lb.	.10¼ –	.....
Tank, (f.o.b. N.Y.)	lb.	.10¼ –	.....

Fish Oils

Cod, Newfoundland, bbl.	gal.	$0.64 –	$0.66
Menhaden, light pressed, bbl.	gal.	.60 –	.....
White bleached, bbl.	gal.	.62 –	.....
Blown, bbl.	gal.	.66 –	.....
Crude, tanks (f.o.b. factory)	gal.	..... –	.....
Whale No. 1 crude, tanks, coast	lb.	..... –	.....
Winter, natural, bbl.	gal.	.75 –	.76
Winter, bleached, bbl.	gal.	.78 –	.79

Oil Cake and Meal

Coconut cake, bags	ton	$30.00 –	....
Cottonseed meal, f.o.b. mills	ton	38.00 –	....
Linseed cake, bags	ton	35.00 –	36.00
Linseed meal, bags	ton	38.00 –	40.00

Dye & Tanning Materials

Albumen, blood, bbl.	lb.	$0.50 –	$0.55
Albumen, egg, tech, kegs	lb.	.95 –	.97
Cochneal, bags	lb.	.32 –	.34
Cutch, Borneo, bales	lb.	.04½ –	.04¾
Cutch, Rangoon, bales	lb.	.13½ –	.14¼
Dextrine, corn, bags 100 lb.		3.74 –	3.94
Dextrine, gum, bags 100 lb.		4.09 –	4.19
Divi-divi, bags	ton	38.00 –	39.00
Fustic, sticks	ton	30.00 –	35.00
Fustic, chips, bags	lb.	.04 –	.05
Gambier com., bags	lb.	.10¼ –	.11½
Logwood, sticks	ton	25.00 –	26.00
Logwood, chips, bags	lb.	.02½ –	.03
Quebracho, solid, 65% tannin, bbl.	lb.	.05 –	.05½
Sumac, dom., 51°, bbl.	lb.	.06½ –	.07¼

Extracts

Archil, conc., bbl.	lb.	$0.16½ –	$0.20
Chestnut, 25% tannin, tanks	lb.	.01½ –	.02½
Divi-divi, 25% tannin, bbl.	lb.	.04 –	.05
Fustic, crystals, bbl.	lb.	.20 –	.22
Fustic, liquid, 42°, bbl.	lb.	.08 –	.09
Gambier, liq., 25% tannin, bbl.	lb.	.09½ –	.10
Hematine crys., bbl.	lb.	.14 –	.18
Hemlock, 25% tannin, bbl.	lb.	.03½ –	.04
Hypernic, solid, drums	lb.	.24 –	.26
Hypernic, liquid, 51°, bbl.	lb.	.09½ –	.10½
Logwood, crys., bbl.	lb.	.14 –	.15
Logwood, liq., 51°, bbl.	lb.	.08 –	.09
Osage Orange, 51°, liquid, bbl.	lb.	.07 –	.08
Osage Orange, powder, bg.	lb.	.14 –	.15
Quebracho, solid, 65% tannin, bbl.	lb.	.05 –	.05½
Sumac, dom., 51°, bbl.	lb.	.06½ –	.07¼

Dry Colors

Blacks—Carbongas, bags, f.o.b. works, contract	lb.	$0.07½ –	$0.09
spot, cases	lb.	.11 –	.15
Lampblack, bbl.	lb.	.12 –	.40
Mineral, bulk	ton	35.00 –	45.00
Blues—Bronze, bbl.	lb.	.40 –	.43
Prussian, bbl.	lb.	.40 –	.43
Ultramarine, bbl.	lb.	.08 –	.35
Browns, Sienna, Ital., bbl.	lb.	.06 –	.14
Sienna, Domestic, bbl.	lb.	.03½ –	.04
Umber, Turkey, bbl.	lb.	.04 –	.04½
Greens—Chrome, C.P. Light, bbl.	lb.	.28 –	.30
Chrome, commercial, bbl.	lb.	.12 –	.12½
Paris, bulk	lb.	.26 –	.28
Reds, Carmine No. 40, tins	lb.	4.50 –	4.70
Iron oxide red, casks	lb.	.10 –	.16
Para toner, kegs	lb.	1.00 –	1.10
Vermilion, English, bbl.	lb.	1.25 –	.....
Yellow, Chrome, C.P. bbls.	lb.	.16½ –	.17
Ocher, French, casks	lb.	.02½ –	.03

Waxes

Bayberry, bbl.	lb.	$0.22 –	$0.23
Beeswax, crude, Afr. bg.	lb.	.25 –	.26
Beeswax, refined, light, bags	lb.	.32 –	.34
Beeswax, pure white, cases	lb.	.40 –	.41
Candellila, bags	lb.	.23 –	.23½
Carnauba, No. 1, bags	lb.	.38 –	.40
No. 2, North Country, bags	lb.	.28½ –	.29
No. 3, North Country, bags	lb.	.19½ –	.20
Japan, cases	lb.	.24½ –	.25
Montan, crude, bags	lb.	.05½ –	06
Paraffine, crude, match, 105-110 m.p., bbl.	lb.	.05½ –	....
Crude, scale 124-126 m.p. bags	lb.	.05 –	.05½
Ref., 118-120 m.p., bags	lb.	.05½ –	....
Ref., 123-125 m.p., bags	lb.	.05½ –	....
Ref., 128-130 m.p., bags	lb.	.05½ –	....
Ref., 133-135 m.p., bags	lb.	.06 –	....
Ref., 135-137 m.p., bags	lb.	.06¼ –	.06¼
Stearic acid, sgle pressed, bags	lb.	.11 –	.11½
Double pressed, bags	lb.	.11½ –	.11½
Triple pressed, bags	lb.	.13 –	.13½

Fertilizers

Acid phosphate, 16%, bulk, works	ton	$7.50 –	$7.75
Ammonium sulphate, bulk f.o.b. works 100 lb.		2.80 –	2.85
Blood, dried, bulk	unit	4.10 –	4.15
Bone, raw, 3 and 50, ground	ton	26.00 –	28.00
Fish scrap, dom., dried, wks.	unit	..... –	.....
Nitrate of soda, bags 100 lb.		2.55 –	.....
Tankage, high grade, f.o.b. Chicago	unit	2.25 –	.....
Phosphate rock, f.o.b. mines			
Florida pebble, 68-72%	ton	3.30 –	4.20
Tennessee, 75%	ton	7.00 –	7.25
Potassium muriate, 80%, bags	ton	34.55 –	.....
Potassium sulphate, bags basis 90%	ton	45.85 –	.....
Double manure salt	ton	27.00 –	.....
Kainit	ton	7.22 –	.....

Crude Rubber

Para—Upriver fine	lb.	$0.18½ –	.....
Upriver coarse	lb.	.15 –	.....
Upriver caucho ball	lb.	.17 –	.....
Plantation—First latex crepe	lb.	.22½ –	.....
Ribbed smoked sheets	lb.	.22½ –	.....
Amber crepe No. 1	lb.	.22½ –	.22¾

Gums

Copal, Congo, amber, bags	lb.	$0.10 –	$0.15
East Indian, bold, bags	lb.	.20 –	.21
Manila, pale, bags	lb.	.19 –	.20
Pontinak, No. 1 bags	lb.	.19 –	.20
Damar, Batavia, cases	lb.	.25 –	.26
Singapore, No. 1, cases	lb.	.31 –	.32
Singapore, No. 2, cases	lb.	.21½ –	.22
Kauri, No. 1, cases	lb	.62 –	.64
Ordinary chips, cases	lb.	.20½ –	.21½
Manjak, Barbados, bags	lb.	.08 –	.11

Shellac

Shellac, orange fine, bags	lb.	$0.59 –	$0.60
Orange superfine, bags	lb.	.61 –	.62
A. C. garnet, bags	lb.	.56 –	.57
Bleached, bonedry	lb.	.67 –	....
Bleached, fresh	lb.	.56 –	....
T. N., bags	lb.	.57 –	....

Miscellaneous Materials

Asbestos, crude No. 1, f.o.b., Quebec sh. ton		$300.00 –	$400.00
Asbestos, shingle, f.o.b., Quebec sh. ton		50.00 –	70.00
Asbestos, cement, f.o.b., Quebec sh. ton		20.00 –	25.00
Barytes, grd., white, f.o.b. mills, bbl. net ton		16.00 –	17.00
Barytes, grd., off-color, f.o.b. Balt. net ton		13.00 –	14.00
Barytes, floated, f.o.b. St. Louis, bbl. net ton		23.00 –	24.00
Barytes, crude f.o.b. mines, bulk net ton		8.00 –	8.50
Casein, bbl., tech. lb.		.11½ –	.12
China clay (kaolin) crude,			
No. 1, f.o.b. Ga. net ton		7.00 –	8.00
Washed, f.o.b. Ga. net ton		8.50 –	9.00
Powd., f.o.b. Ga. net ton		13.00 –	20.00
Crude f.o.b. Va. net ton		6.00 –	8.00
Ground, f.o.b. Va. net ton		13.00 –	19.00
Imp., lump, bulk net ton		15.00 –	20.00
Imp., powd. net ton		45.00 –	50.00
Feldspar, No. 1 f.o.b. N.C. long ton		6.50 –	7.00
No. 2 f.o.b. N.C. long ton		4.50 –	5.00
No. 1 soap long ton		7.00 –	.....
No. 1 Canadian, f.o.b. mill, powd. long ton		20.00 –	.....
Graphite, Ceylon, lump, first quality, bbl. lb.		.05½ –	.06
Ceylon, chip, bbl. lb.		.04½ –	.05
High grade amorphous crude ton		15.00 –	35.00
Gum arabic, amber, sorts, bags lb.		.11 –	.11½
Gum tragacanth, sorts, bags lb.		.48 –	.53
No. 1, bags lb.		1.35 –	1.40
Kieselguhr, f.o.b. Cal. ton		40.00 –	42.00
F.o.b. N. Y. ton		50.00 –	55.00
Magnesite, calcined, f.o.b. Cal. ton		35.00 –	45.00
Pumice stone, imp., casks lb.		.03 –	.35
Dom., lump, bbl. lb.		.05 –	.05½
Dom., ground, bbl. lb.		.05 –	.06
Silica, glass sand, f.o.b. Ind. ton		2.00 –	2.50
Silica, sand blast, f.o.b. Ind. ton		2.25	3.50
Silica, amorphous, 200-mesh, f.o.b. Ill. ton		20.00 –	.....
Silica, glass sand, f.o.b. Ill. ton		1.75 –	3.00
Soapstone, coarse, f.o.b. Vt., bags ton		7.50 –	8.00
Talc, 200 mesh, f.o.b., Vt., bags, extra ton		10.00 –	.....
Talc, 200 mesh, f.o.b. Ga., bags ton		8.00 –	12.00
Talc, 325 mesh, f.o.b. New York, grade A bags ton		14.75 –	.....

Mineral Oils

Crude, at Wells

Pennsylvania	bbl.	$4.00 –	$4.50
Corning	bbl.	2.15 –	.....
Cabell	bbl.	2.20 –	.....
Somerset	bbl.	2.30 –	2.50
Illinois	bbl.	2.07 –	.....
Indiana	bbl.	2.08 –	.....
Kansas and Okla. under 28 deg.	bbl.	1.00 –	.....
California, 35 deg. and up	bbl.	1.40 –	.....

Gasoline, Etc.

Motor gasoline, steel bbls.	gal.	$0.20 –	.....
Naphtha, V. M. & P. deod, steel bbls.	gal	.19 –	.....
Kerosene, ref. tank wagon	gal.	.15 –	.....
Bulk, W.W. delivered, N.Y.	gal.	.08½ –	.....
Lubricating oils:			
Cylinder, Penn., filtered	gal.	.32 –	.38
Bloomless, 30@31 grav.	gal.	.20 –	.....
Paraffin, pale	gal.	.18 –	.18½
Spindle, 200, pale	gal.	.22 –	.....
Petrolatum, amber, bbls.	lb.	.04 –	.04½
Paraffine wax (see waxes)			

Refractories

Bauxite brick, 56% Al_2O_3, f.o.b. Pittsburgh	1,000	$140-	$145
Chrome brick, f.o.b. Eastern shipping points	ton	45-47	
Chrome cement, 40-50% Cr_2O_3	ton	23-27	
40-45% Cr_2O_3, sacks, f.o.b. Eastern shipping points	ton	23.00	
Fireclay brick, 1st. quality, 9-in. shapes, f.o.b. Ky. wks.	1,000	42-45	
2nd. quality, 9-in. shapes, f.o.b. wks.	1,000	35-38	
Magnesite brick, 9-in. straight (f.o.b. wks.)	ton	65-68	
9-in. arches, wedges and keys	ton	80-85	
Scraps and splits	ton	85	
Silica brick, 9-in. sizes, f.o.b. Chicago district	1,000	50-53	
Silica brick, 9-in. sizes, f.o.b. Birmingham district	1,000	50-53	
F.o.b. Mt. Union, Pa.	1,000	42-45	
Silicon carbide refract. brick, 9-in.	1,000	1180.00	

Ferro-Alloys

Ferrotitanium, 15-18% f.o.b. Niagara Falls, N.Y.	ton	$200.00 –	.....

Ferrochromium, per lb. of Cr, 1-2% C	lb.	$0.30	.....
4-6% C	lb.	.11½	.....
Ferromanganese, 78-82% Mn, Atlantic seabd. duty paid	gr. ton	107.50	.....
Spiegeleisen, 19-21% Mn	gr. ton	38.00	40.00
Ferromolybdenum, 50-60% Mo, per lb. Mo	lb.	2.00	2.50
Ferrosilicon, 10-12%	gr. ton	41.50	46.50
50%	gr. ton	75.00	80.00
Ferrotungsten, 70-80%, per lb. of W	lb.	.91	.93
Ferro-uranium, 35-50%, of U, per lb. of U	lb.	4.50	.....
Ferrovanadium, 30-40%, per lb. of V	lb.	3.50	4.00

Ores and Semi-finished Products

Bauxite, dom. crushed, dried, f.o.b. shipping points	ton	$5.50	$8.75
Chrome ore, Calif. concentrates, 50% min. Cr_2O_3	ton	22.00	23.00
C.i.f. Atlantic seaboard	ton	19.50	24.00
Coke, fdry., f.o.b. ovens	ton	5.00	5.50
Coke, furnace, f.o.b. ovens	ton	3.75	4.00
Fluorspar, gravel, f.o.b. mines, Illinois	ton	23.50	.....
Ilmenite, 52% TiO_2 Va.	lb.	.01½	.....
Manganese ore, 50% Mn, c.i.f. Atlantic seaport	unit	.44	.46
Manganese ore, chemical (MnO_2)	ton	75.00	80.00
Molybdenite, 85% MoS_2, per lb. MoS_2, N. Y.	lb.	.80	.....
Monazite, per unit of ThO_2, c.i.f., Atl. seaport	lb.	.06	.08
Pyrites, Span., fines, c.i.f. Atl. seaport	unit	.11½	.12
Pyrites, Span., furnace size, c.i.f. Atl. seaport	unit	.11½	.12
Pyrites, dom. fines, f.o.b. mines, Ga.	unit	.12	.....
Rutile, 95% TiO_2	lb.	.12	.15
Tungsten, scheelite, 60% WO_3 and over	unit	10.00	.....
Tungsten, wolframite, 60% WO_3	unit	9.00	9.25
Uranium ore (carnotite) per lb. of U_3O_8	lb.	3.50	3.75
Uranium oxide, 96% per lb. U_3O_8	lb.	12.25	2.50
Vanadium pentoxide, 99%	lb.	2.00	14.00
Vanadium ore, per lb. V_2O_5	lb.	1.00	1.25
Zircon, 99%	lb.	.06	.07

Non-Ferrous Metals

Copper, electrolytic	lb.	$0.13½	.....
Aluminum, 98 to 99%	lb.	.27	$.28
Antimony, wholesale, Chinese and Japanese	lb.	.09½	.10
Nickel, 99%	lb.	.28	.32
Monel metal, shot and blocks	lb.	.32	
Tin, 5-ton lots, Straits	lb.	.50½	
Lead, New York, spot	lb.	.08½	
Lead, E. St. Louis, spot	lb.	.08	
Zinc, spot, New York	lb.	.0655	
Zinc, spot, E. St. Louis	lb.	.0620	
Silver (commercial)	oz.	.63¾	
Cadmium	lb.	.70–.75	
Bismuth (500 lb. lots)	lb.	2.35	
Cobalt	lb.	2.50-3.00	
Magnesium, ingots, 99%	lb.	.90–.95	
Platinum	oz.	115.00	
Iridium	oz.	275.00-300.00	
Palladium	oz.	83.00	
Mercury	75 lb.	70.00-72.00	
Tungsten powder	lb.	.95–1.00	

Finished Metal Products

	Warehouse Price Cents per Lb.
Copper sheets, hot rolled	19.75
Copper bottoms	29.75
Copper rods	20.25
High brass wire	18.75
High brass rods	16.00
Low brass wire	20.50
Low brass rods	21.00
Brazed brass tubing	24.50
Brazed bronze tubing	25.75
Seamless copper tubing	23.75
Seamless high brass tubing	22.50

OLD METALS—The following are the dealers purchasing prices in cents per pound

Copper, heavy and crucible	11.50 @ 12.00
Copper, heavy and wire	11.00 @ 11.25
Copper, light and bottoms	9.00 @ 9.25
Lead, heavy	7.25 @ 7.50
Lead, tea	5.50 @ 5.75
Brass, heavy	6.00 @ 6.25
Brass, light	5.00 @ 5.25
No. 1 yellow brass turnings	7.00 @ 7.25
Zinc scrap	4.00 @ 4.25

Structural Material

The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses in the cities named:

	New York	Chicago
Structural shapes	$3.54	$3.54
Soft steel bars	3.54	3.54
Soft steel bar shapes	3.54	3.54
Soft steel bands	4.39	4.39
Plates, ¼ to 1 in. thick	3.64	3.64

Industrial

Financial, Construction and Manufacturing News

Construction and Operation

Alabama

TALLADEGA—The Common Council is arranging a bond issue of $75,000, authorized by voters, for the installation of a municipal artificial gas plant, for which plans will be completed at an early date.

Arizona

PHOENIX—The Industrial Chemical Co. has purchased a local site and will have plans drawn at once for a new plant. It will be 1-story, estimated to cost about $30,000, including equipment. P. G. Spilsbury is president.

Arkansas

BAUXITE—The Norton Co., Worcester, Mass., manufacturer of abrasive materials, grinding wheels, etc., is perfecting plans for the establishment of a local raw material works, comprising a number of buildings with equipment for extensive output. The majority of machinery will be electrically operated. Work will begin at an early date.

California

SAN FRANCISCO—The Paraffine Companies, Inc., 40 1st St., has arranged for a bond issue of $750,000, the entire proceeds to be used for plant extensions and improvements, as arranged in a 1924 expansion program. The company specializes in the manufacture of paper products, boxboard, etc., and will soon break ground for the erection of a 1-story addition to its mill at Antioch, Calif., to be 220x295 ft., estimated to cost $65,000. A general contract for the building has been let to Fred Stamm, 25 A St., Antioch. Leland Rosener, Insurance Exchange Bldg., San Francisco, is engineer.

TRACY—The Alameda Sugar Co., Balfour Bldg., San Francisco, is perfecting plans for immediate enlargements and improvements in its local beet sugar mill, which has been closed for a number of years past. The plant has a rated capacity of 600 tons and this will be increased to 800 tons with the installation of additional grinding and other machinery. New conveying equipment will be installed. Arthur C. Bullen, Los Angeles, will be company engineer in charge of the work.

BARTLE—The Mount Shasta Silica Co., Weed, Calif., organized with a capital of $300,000, is planning for the construction of a new plant on its local mineral properties for the production of commercial silica and other kindred products. The initial works will be equipped for an output of about 100 tons a day, using a mechanical air process as a feature of operation. A power house and other buildings will also be erected. Additional units will be constructed later. Fred M. Miller is engineer in charge.

Delaware

WILMINGTON—The Electric Hose & Rubber Co., 12th and Dure Sts., is making enlargements in its plant, with the installation of considerable equipment for the manufacture of airbrake hose and other rubber products, designed to double, approximately, the present capacity. C. D. Garretson is president.

Florida

ST. PETERSBURG—The Farmer Concrete Works, Inc., heretofore operating in the Bayboro section, has acquired property in the Wilson Terminal district, 24th St. and 7th Ave., totaling seven lots, as a site for a new plant for the manufacture of molded cement and concrete products. Plans are under way for the erection of a 1-story structure, 100x100 ft., to be equipped with mixing, molding, conveying and other machinery, including hydraulic presses, for large output. The majority of the machinery will be electrically operated. It is purposed to remove the Bayboro works to the new location. H. A. Farmer is president and treasurer.

Georgia

BRUNSWICK—The Southern Aromatic Co., recently organized, has leased a building at the Atlanta, Birmingham & Atlantic Railway terminal, and will establish a plant for the manufacture of essential oils. The installation of necessary equipment will soon be commenced. Robert L. and Paul Jeanard head the company.

Idaho

RIGBY—The Utah-Idaho Sugar Co., Salt Lake City, Utah, has acquired the mill of the Beet Growers' Sugar Co., on local site, for a consideration stated at $800,000. The new owner previously had been considering plans to operate the plant under lease, and purposes to make a number of improvements, with additional equipment, for the coming season run. It is said that this purchase gives the Utah-Idaho company a total of twenty-one mills.

Iowa

DAVENPORT—The Union Carbide & Carbon Corp., 30 East 42nd St., New York, and 122 South Michigan Ave., Chicago, is reported to have taken options on a local site for the construction of a new plant for its Linde Air Products Co. division, manufacturer of commercial oxygen, acetylene apparatus, etc. It is said that plans for the works will be prepared at an early date, with initial investment in excess of $150,000, including equipment.

Maryland

BALTIMORE—The Glidden Co., 108 West Fayette St., manufacturer of paints, varnishes, etc., with plant at St. Helena, Md., has awarded a general contract to the Austin Co., 1015 Chestnut St., Philadelphia, Pa., for the erection of its proposed new plant on Colgate Creek, consisting of five 1- and 2-story buildings, 58x120 ft., 55x120 ft., 41x72 ft., 65x70 ft. and 45x92 ft., respectively, estimated to cost $80,000. Plans have been filed and work will begin at once. Headquarters of the company are at Cleveland, Ohio.

Massachusetts

FRAMINGHAM—The Dennison Mfg. Co., manufacturer of paper specialties, has awarded a contract to the Morton C. Tuttle Co., Boston, for the erection of a 1-story addition. Improvements will be made, also, in the present plant, including remodeling in different departments.

QUINCY—J. H. Taylor, 91 Holmes St., has filed plans for the erection of a 1-story foundry, to be equipped for the manufacture of brass and bronze castings. Work will commence at once.

Michigan

KALAMAZOO—The Sutherland Paper Co. has awarded a general contract to Oscar F. Miller & Co., Kalamazoo, for the erection of a 1-story addition to its mill, estimated to cost about $100,000, including equipment.

DETROIT—The Akron Varnish Co., Kresge Bldg., has completed plans and will soon commence the erection of a new plant at 3301 Bourke St., to be equipped for considerable increased production. It is reported to cost in excess of $40,000.

KALAMAZOO—The Standard Paper Co. has purchased a tract of property totaling about 5 acres, and is said to have preliminary plans under advisement for the construction of a new mill, for which details are expected to be consummated at an early date. B. C. Dickinson is president.

HOLLAND—The Vandenberg Brothers Oil Co. has work nearing completion on remodeling and improvements at the former local plant of the Superior Chemical Co., with the installation of equipment for the manufacture of fertilizer products. It is expected to commence operations at an early date, with large working force.

New Jersey

TRENTON—The Puritan Rubber Co., Perrine Ave., has awarded a contract to the James H. Morris Co., 211 North Mont-

gomery St., for the erection of a 1-story addition to its mill, on which work will be commenced at once.

LINDEN—The Superior Novelty Co., 1124 East Jersey St., Elizabeth, N. J., has awarded a contract to the H. Wilhelm Co., 119 Division St., Elizabeth, for the rebuilding of its local plant on the Edgar Rd., recently destroyed by fire. The new structure will be 1-story, 60x200 ft., and is estimated to cost about $35,000. The company specializes in the manufacture of celluloid, fiber and composition products.

New York

NEW YORK — The Pierce Oil Corp., 25 Broad St., is being reorganized and will be known in the future as the Pierce Petroleum Corp. Plans are under way for a capital stock issue to total about $9,000,000, of which approximately $2,000,000 will be used for extensions and betterments in refineries, storage and distributing facilities. The new company will operate with a capital of $2,500,000. W. H. Coverdale is chairman of the board.

Ohio

DAYTON—The Fleischmann Co., 701 Washington St., New York, manufacturer of yeast, has acquired a local site at 648 Main St., and plans for the early erection of a new branch plant, to be 1-story, 40x125 ft., for which bids on a general contract will soon be asked. G. P. Howe, Dayton, is architect.

BELLAIRE—The Bellaire Enamel Co. has purchased the local Enterprise plant of the American Stamping & Enameling Co., for a consideration stated to be $800,000. A number of improvements will be made and the works placed in operation at an early date with initial working force of about 400 persons. It consists of a number of buildings with eleven furnaces. The purchasing company is perfecting plans for the rebuilding of its former plant, destroyed by fire late in January with loss estimated at $400,000. The new works, to be operated in conjunction with the acquired plant, will comprise a group of buildings and power house, with seven furnaces, and is expected to cost close to $500,000, with equipment. Benjamin Kapner is president, and Charles Kapner vice-president and general manager.

LIMA—The Air Reduction Co., 342 Madison Ave., New York, has plans in progress and will take bids in about 60 days for the erection of a new plant on local site for the production of industrial oxygen and kindred products. It will cost about $65,000. Francisco & Jacobus, 511 5th Ave., New York, are architects and engineers.

TOLEDO—The Libbey-Owens Sheet Glass Co., Nicholas Bldg., has awarded a general contract to the A. Bentley & Sons Co., Toledo, for the initial unit of its proposed plant for the manufacture of plate glass on site at East Broadway and the New York Central Railroad, acquired a number of months ago. It will consist of a group of buildings with power house, estimated to cost close to $2,000,000, and according to contract is to be completed by February, 1925. It will have a rated output of 8,000,000 ft. of material per annum.

YOUNGSTOWN—The Republic Iron & Steel Co. will have plans prepared at once for the erection of a new 1-story tube mill at its plant, to be used for the production of butt welded tubing, pipe, etc. It will cost in excess of $450,000.

Pennsylvania

PHILADELPHIA—The Gill Glass Co., Amber and Venango Sts., has awarded a general contract to William R. Dougherty, 1610 Sansom St., for the construction of a 1-story addition to cost about $30,000, including equipment. It is expected to begin work at once. The building will be used for general manufacturing.

MERTZTOWN—The Atlas Mineral Products Co., manufacturer of paint pigments, etc., has authorized plans for the immediate rebuilding of the portion of its plant destroyed by fire, April 1, with loss reported at about $30,000. The reconstruction will cost close to a like amount. Additional equipment will be installed. M. F. Wirtz is one of the heads of the company.

Tennessee

KNOXVILLE—The Burdett Oxygen Co., Chattanooga, Tenn., manufacturer of industrial oxygen, is perfecting plans for the erection of a new branch plant on local site, and expects to begin work at an early date. A list of equipment to be installed will soon be arranged.

CLARKSVILLE—The Kentucky Public Service Co. will commence the erection of a new gas-generating plant, with silica retorts, etc., estimated to cost in excess of $200,000, including equipment. Contracts are being let for different features of the work.

Texas

WACO—The Industrial Cotton Oil Co. has tentative plans under advisement for the rebuilding of the portion of its local mill destroyed by fire, March 30, with loss estimated at about $32,000, including equipment.

FORT WORTH—The Burton Concrete Co., Dan Waggoner Bldg., recently formed with a capital of $70,000, will arrange a list of equipment for installation at its proposed local plant for the manufacture of tile, sewer pipe and kindred products, to develop an initial output of about 400 tons per day, consisting of pressing and mixing machines, metal molds, drying apparatus, etc. Work on the plant will soon be started. L. L. Burton is president.

Utah

SALT LAKE CITY—The International Smelting Co., a subsidiary of the Anaconda Copper Mining Co., 25 Broadway, New York, has acquired the plant and property of the Utah Consolidated Mining Co., defunct, for a consideration stated at $1,000,000. The new owner plans to operate the plant, and will make a number of improvements and extensions for increased capacity.

West Virginia

HARPERS FERRY—The Harpers Ferry Paper Co. has tentative plans under advisement for extensions and improvements in its local pulp mill, including the installation of equipment for considerable increase in output. A bond issue of $250,000 is being arranged, a portion of the proceeds to be used for the expansion. It is purposed, also, to acquire additional properties.

RIDGELEY—The Titan Cement Co., lately organized, has secured options on a tract of property along the Potomac River, near Ackerman, vicinity of Ridgeley, and plans for the construction of a new mill to develop an initial daily output of about 1,200 bbl. of cement. A large tract of property for raw material supply has also been secured. The works will include a power house, and are estimated to cost about $300,000, with machinery.

Wisconsin

MANITOWOC—The Aluminum Goods Mfg. Co., Franklin St., has tentative plans under consideration for the erection of an addition to its plant, about 8-story and basement. George Vits is president.

New Companies

RAMIER-HALL WAX PAPER Co., 1200 Shrine Bldg., Memphis, Tenn.; waxed and other prepared paper products; $50,000. Incorporators: J. F. Ramier and R. W. Hall.

BROUGHTON ADHESIVE & SPECIALTY Co., Boston, Mass.; adhesives, pastes, etc.; $50,000. Harry J. Broughton is president; and Charles C. Fisher, 38 Pearson St., Saugus, Mass., treasurer.

UNIFLEX RUBBER Co., East Rutherford, N. J.; molded rubber products; $125,000. Incorporators: Henry and Hermann F. Lemmermann, and Louis G. Davenport, 40 Paterson Ave., East Rutherford. The last noted is representative.

AMERICAN RAPIDASE Co., New York, N. Y.; chemicals and chemical byproducts; 3,000 shares of stock, no par value. Incorporators: L. and M. Willerstein, and J. Q. Rice. Representative: F. J. Knorr, Albany, N. Y., attorney.

SUPERIOR PAINT CORP., Los Angeles, Calif.; paints, varnishes, etc.; $1,500,000; paints, oils, varnishes, etc. Incorporators: John E. Van Horn, A. P. Hugh, J. D. Carson and George W. Brown, M. D., all of Los Angeles.

HUBERT ART GLASS Co., INC., Bridgeport, Conn.; glass products; $50,000. Incorporators: Henry Greenstein, Joseph Hubert and John L. Carpenter, 111 Elmwood Pl., Bridgeport. The last noted is representative.

RIVERSIDE BRASS & ALUMINUM FOUNDRY Co., Grand Rapids, Mich.; brass, aluminum, bronze and other metal castings; $15,000. Incorporators: George G. Cadey, Henry Buskers and Leonard De Vos, 15 Mount Vernon St., N. W., Grand Rapids. The last noted is representative.

JOHN WACHTEL Co., Indianapolis, Ind.; fertilizer products; $35,000. Incorporators: John, Henry and Joseph Wachtel, all of Indianapolis.

QUALITY ENAMELING & PORCELAINING Co., San Francisco, Calif.; enamel products; $450,000. Incorporators: Lyle P. Nutcher, Walter P. Kelso and Robert E. Doss. Representative: John V. Copren, Hobart Bldg., San Francisco.

ATLANTIC PAINT & VARNISH REMOVER Co., INC., Boston, Mass.; varnish removers, chemical compounds, etc.; $20,000. Aubin J. Horton is president; Alvin A. Sobel, vice-president; and Cecelia M. Feigh, 1317 West 72nd St., Chicago, Ill., treasurer. The last noted is representative.

COLESPORT Co., Jersey City, N. J., care of the Corporation Trust Co., 15 Exchange Pl., Jersey City, representative; vegetable and mineral oil products; $500,000.

STANDARD CHEMICAL PRODUCTS Co., 115 Concord Ave., Memphis, Tenn.; chemicals and chemical byproducts; $104,000. Incorporators: David D. Lee and Van W. Rogers.

DIAMOND OIL CORP., Oklahoma City, Okla.; petroleum products; $100,000. Incorporators: L. C. Roberts, Thomas E. Elliott and A. J. Schlosser, all of Oklahoma City.

GATES-BURNS PAPER PRODUCTS Co., Los Angeles, Calif.; paper specialties; $200,000. Incorporators: A. E. Gates, John J. Walther and R. J. Burns. Representative: Fred E. Peterson, 611 Story Bldg., Los Angeles.

BERTHORN Co., New York, N. Y.; chemicals and affiliated products; $25,000. Incorporators: W. K. Thorn, W. B. Giles and R. Cunningham. Representative: Henry Schwed, 2 Rector St., New York.

BELMONT OIL Co., Boston, Mass.; refined oils; $300,000. Willis N. Tuller, president; and John L. Gwyer, Jr., 9 Norway St. Boston, treasurer and representative.

IMPERIAL RUBBER CORP., Wilmington, Del., care of the Colonial Charter Co., Ford Bldg., Wilmington, representative; rubber products; $150,000.

STAY WHITE Co., INC., Los Angeles, Calif.; cement and plaster compounds; $25,000. Incorporators: Chester C. Cox and Harry Houghland. Representative: Derthick & Hull, I. N. Van Nuys Bldg., Los Angeles.

COUNSELL FILM PROCESS & CHEMICAL Co., Long Island City, N. Y.; chemical products; $80,000. Incorporators: A. M. Henry, C. T. Counsell and A. J. Clark. Representative: Munn, Anderson & Munn, 233 Broadway, New York.

LUMINOL CORP., Pittsburgh, Pa., care of the Capital Trust Co. of Delaware, Dover, Del.; compressed gases, commercial oxygen, etc.; $150,000. Incorporators: George S. Wisecarver, Pittsburgh; E. G. Loughner, Wilkinsburg, Pa.; and R. B. Swope, Washington, D. C.

METAL COATING Co., Oklahoma City, Okla.; protective paints, compounds, etc.; $10,000. Incorporators: George T. Barr, E. E. Gains and W. J. Clark, Oklahoma City, Okla.

KUNKEN RUBBER WORKS, INC., New York, N. Y.; rubber products; $50,000. Incorporators: L. Krown and E. Gottlieb. Representative: J. L. Diamond, 305 Broadway, New York.

Industrial Notes

THE MARLAND OIL Co. OF CALIFORNIA, INC., 200 Bush St., San Francisco, Calif., recently organized, has elected the following: President, Franklin R. Kenney; first vice-president, Carl H. Beal; second vice-president, Monroe H. Good; secretary, C. G. Smith, and treasurer, A. K. Theobald.

THE PARAGON REFINING Co., Toledo, O., manufacturer of lubricating oils, etc., has elected Henry L. Thompson chairman of the board of directors; L. H. Crawford, president; Rome E. Goodwin, vice-president in charge of sales, Charles Leroux, secretary and treasurer.

DEVOE & RAYNOLDS Co., INC., New York, manufacturer of paints, varnishes, etc., has appointed E. S. Phillips general manager, with supervision over the entire organization. A. C. Stephan has been elected assistant treasurer, in charge of administrative affairs; and E. S. Blackledge has been appointed general superintendent of plants.

THE MOORE STEAM TURBINE CORP., manufacturer of centrifugal pumps and steam turbines, announces the opening of its own Pittsburgh office in the Ferguson Bldg., 319 Third Ave. H. A. Schultz, formerly sales manager of the Frederick Pump Co., has been appointed manager.